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DRAFT

ENVIRON

ADDENDUM TO REMEDIAL INVESTIGATION REPORT

Remedial Investigation/Feasibility Study
Eagle Zinc Company Site
Hillsboro, Illinois

Submitted to:

U.S. Environmental Protection Agency, Region 5
and
Illinois Environmental Protection Agency

Submitted by:

ENVIRON International Corporation
Deerfield, Illinois

On behalf of:

Eagle Zinc Parties

April 2005

ENVIRON

April 11, 2005

Sent via Electronic Mail

Mr. Dion Novak
Superfund Division
United States Environmental Protection Agency
77 West Jackson Boulevard
Mail Code: SR-6J
Chicago, IL 60604

Re: Draft Addendum to Remedial Investigation Report
Remedial Investigation/Feasibility Study
Eagle Zinc Company Site, Hillsboro, Illinois

Dear Mr. Novak:

Enclosed please find the draft report entitled *Addendum to Remedial Investigation Report* for the Eagle Zinc Company Site. The laboratory data are provided on an enclosed compact disk. Data validation reports are enclosed separately.

If you have any questions concerning this submission, please do not hesitate to contact us.

Sincerely,

ENVIRON International Corporation

F. Ross Jones

F. Ross Jones, P.G.
Manager

FRJ:rms
R:\Client Project Files\Eagle Zinc-Hillsboro_21-7400E\RI Addendum\Draft RI Addendum\Transm ltr_041105.doc

Enclosure

cc: Thomas Krueger, Esq. – USEPA Region 5
Rick Lanham – IEPA Bureau of Land
Lisa Cundiff – CH2M Hill
John Ix, Esq. – Dechert
Lois Kimbol, Esq. – Dechert
Paul Harper – Eagle-Picher
Gordon Kuntz – Sherwin-Williams
Roy Ball – ENVIRON
Janet Kester – ENVIRON
Jeff Margolin – ENVIRON

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Under penalty of law, I certify that, to the best of my knowledge, after appropriate inquiries of all relevant persons involved in the preparation of this Report, the information submitted is true, accurate, and complete.

Roy O. Ball, Ph.D., P.E.
Project Coordinator
Eagle Zinc Company Site

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(continued)

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LIST OF ACRONYMS

AOC	Administrative Order on Consent
bgs	below ground surface
COPCs	Constituents of Potential Concern
CPH	Carbon Plant Hutch
Enchem	Enchem Laboratory
ENVIRON	ENVIRON International Corporation
ERSE	Ecological Risk Screening Evaluation
ESVs	Ecotoxicity Screening Values
GBI	Goodwin-Broms, Inc.
HHRA	Human Health Risk Assessment
HQ	Hazard Quotient
IDPH	Illinois Department of Public Health
mg/kg	milligrams per kilogram
µm	millimeter or micron
MP	Miscellaneous Piles
m/s	meters per second
MSA	Metropolitan Statistical Area
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NOAELs	No Observed Adverse Effects Levels
NP	New Piles
PEF	Particulate Emission Factor
PEF_{RP}	Residue Pile-Specific PEFs
PM	Particulate Matter
RBCs	Risk-Based Concentrations
RCO	Rotary Clean Out
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
RRO	Rotary Residue Oversize
RR1	Rotary Residue Type 1
RR2	Rotary Residue Type 2
RSLs	Residue pile screening levels
SMDPs	Scientific Management Decision Points
SOW	Statement of Work
SPLP	Synthetic Precipitation Leaching Procedure
SROs	Soil Remediation Objectives
TACO	Tiered Approach to Corrective Action Objectives
TAL	Target Analyte List
TCLP	Toxicity Characteristic Leaching Procedure
Us	Surface Wind Speed
Ur	Approach Wind Speed
USEPA	United States Environmental Protection Agency

I. INTRODUCTION

A. Purpose of Report

This report is an addendum to the *Remedial Investigation Report, Eagle Zinc Company Site, Hillsboro, Illinois* (the "RI Report"), which was submitted to the United States Environmental Protection Agency (USEPA) as a final document in February 2005. This additional phase of work, herein referred to as the "RI Addendum", focuses on the evaluation of potential risks associated with historical residual material stockpiles ("residue piles") at the Eagle Zinc Company Site (the "Site"). ENVIRON International Corporation (ENVIRON) has prepared this report on behalf of the Eagle Zinc Parties (the "Parties") as part of the Remedial Investigation/Feasibility Study (RI/FS) for the Site. The RI/FS is being completed pursuant to the Statement of Work (SOW) contained in the December 31, 2001 Administrative Order on Consent (AOC) between the Parties and the USEPA. All sampling activities completed in association with this addendum were conducted in accordance with the AOC, the SOW, and the July 2002 *Remedial Investigation/Feasibility Study Work Plan* (the "RI/FS Work Plan"). In addition, the following documents, correspondence, and communications with the USEPA provide bases for the supplementary risk evaluations provided in this addendum:

- A meeting between the Parties and the USEPA held on November 18, 2005, as memorialized in a letter from John Ix, Esq. to USEPA dated November 29, 2004;
- The RI Report dated February 2005;
- USEPA letter to ENVIRON dated February 21, 2005;
- Electronic mail transmission from USEPA to ENVIRON dated March 8, 2005, which contained a discussion of certain aspects of the RI Addendum scope of work;
- Electronic mail transmission from ENVIRON to USEPA dated March 10, 2005, which outlined the scope of additional on-Site data collection for the RI Addendum;

- Electronic mail transmission from USEPA to ENVIRON dated March 10, 2005, which conditionally approved ENVIRON's data collection plan;
- A conference call held with the USEPA and the Parties on March 18, 2005 in which certain air modeling issues were discussed; and
- Subsequent correspondence with the USEPA concerning certain aspects of these supplemental risk evaluations.

Consistent with the overall goals of the RI, the primary objectives of the RI Addendum are to: (1) provide supplementary information concerning the nature and extent of contamination at the Site associated with the residue piles; (2) assess potential migration pathways from the residue piles by which the contaminants could potentially impact human or ecological receptors; and (3) evaluate potential risks to the receptors. The following documents, previously submitted to and approved by the USEPA, provide bases for and support certain aspects of the RI Addendum:

- *Preliminary Site Evaluation Report, March 2002* (the "PSE Report")
- *Technical Memorandum, Phase 1 - Source Characterization, March 2003* (the "Phase 1 Technical Memorandum")
- *Technical Memorandum, Phase 2 - Migration Pathway Assessment, November 2003* (the "Phase 2 Technical Memorandum")
- *Human Health Risk Assessment, August 2004* (the "HHRA")
- *Ecological Risk Screening Evaluation, August 2004* (the "ERSE")
- *Remedial Investigation Report, February 2005* (the "RI Report")

B. Report Organization

Section I describes the purpose and organization of this report. Section II provides a summary of the physical characteristics of the residue piles. Section III describes supplementary on-Site data collection conducted in March 2005. Section IV presents a discussion of air modeling and deposition calculations performed to estimate potential impacts from the residue piles. Section V presents a supplemental human health risk evaluation for the residue piles. Section VI presents a supplemental ecological risk screening evaluation for the residue piles. Section VII presents the overall conclusions of the RI Addendum.

II. RESIDUE PILE CHARACTERIZATION

A. Physical Characterization of Residue Piles

Residual materials were historically generated at the Site from rotary kiln and smelting operations conducted to refine zinc and to produce zinc products. The residual materials were generally placed in stockpiles located in areas west and southwest of the main plant area. As discussed in the PSE Report, residue pile types were established based on physical characteristics of the materials and knowledge of the manufacturing processes by which the residue piles were generated.[1] The residue pile types include: Rotary Residue Type 1 (RR1), Rotary Residue Type 2 (RR2), Rotary Clean Out (RCO), Rotary Residue Oversize (RRO), Carbon Plant Hutch (CPH), and Miscellaneous Piles (MP). Several additional piles were identified during Phase 1 of the RI.[2] Fifteen (15) residue piles or groups of piles were sampled during Phase 1 of the RI for analysis of Resource Conservation and Recovery Act (RCRA) Metals by the Toxicity Characteristic Leaching Procedure (TCLP) and the Synthetic Precipitation Leaching Procedure (SPLP). These 15 piles/pile groups were also sampled for Target Analyte List (TAL) metals and particle size distribution analysis in March 2005.

The piles generally consist of zinc processing slag with larger size particles (up to greater than 12 inches in diameter), with or without a finer grained matrix. An exception is the CPH material, which was observed to consist primarily of particles with diameters in the range of 0.2 to 0.5 inches. The consistency of the piles ranges from loose and disaggregated to highly compacted (fused, rock-like material). The residue piles range in height from approximately one foot to approximately 25 feet. A photographic log of the 15 piles/pile groups is included in Appendix A. Surface area estimates for the piles are included on residue pile characterization forms provided in Appendix B.

[1] Residue pile types were established during a sampling program conducted by Goodwin-Broms, Inc. (GBI) in May 1998.

[2] These newly identified piles (designated NP) were either not identified by GBI during its 1998 investigations, or were created subsequent to GBI's investigation through a carbon screening process formerly conducted at the Site.

B. Sampling Conducted

1. Pre-RI Off-Site Soil Sampling

In 1993, a series of 16 surface soil samples were collected by the Illinois Environmental Protection Agency (IEPA) at residential properties in the vicinity of the Site (samples X104 through X120). Two background surface soil samples were also collected by the IEPA in the nearby town of Butler, Illinois (samples X101-B/G and X-102-B/G). The IEPA off-Site soil data are presented in Table II-1. The IEPA off-Site residential soil sample locations, concentrations of the metals in these samples that were identified as constituents of potential concern (COPCs) in the investigation phases of the RI, and a superimposed wind-rose diagram are shown in Figure II-1. Metals concentrations generally decrease with distance from the Site, see Figure II-1. With the exception of arsenic, iron, and manganese, all metals concentrations in the off-site soil samples were below conservative USEPA screening levels for residential soils (USEPA Region III Risk-Based Concentrations [RBCs]). Arsenic concentrations detected in the off-Site soil samples were less than, or very close to, the average regional Illinois background level (11.3 milligrams per kilogram [mg/kg]), taken to be the non-Metropolitan Statistical Area (MSA) background value presented in the Illinois Tiered Approach to Corrective Action Objectives (TACO), see Table II-1. The 95% upper confidence limit (UCL) for arsenic in off-Site soils was below the non-MSA value. Furthermore, arsenic is not known to have been used or released at the Site. Iron and manganese marginally exceeded the RBCs in two of the 16 off-site soil samples. However, the 95% UCLs for iron and manganese in off-Site soils was below the non-MSA values.

IEPA's findings were interpreted in a letter dated February 22, 1994 from Mr. K. D. Runkle of the Illinois Department of Public Health (IDPH) to Mr. Brad Taylor of IEPA's Site Assessment Unit. The IDPH letter stated that the soil data collected by IEPA at off-Site Residences indicate "no apparent health concern." This opinion was also conveyed to the residents whose properties had been sampled.

In summary, materially elevated concentrations of Site-related constituents from the residue piles or other historical source are absent in the off-Site residential surface soil samples collected by IEPA in 1993.

2. Sampling Conducted During the RI

The residue piles were investigated in the RI as the most likely potential sources of on-Site and off-Site contamination to environmental media. In addition to the TCLP and SPLP metals analyses noted above, potential impacts from the residue piles were investigated through the collection and analysis of soil, sediment, surface water, and ground water samples, both on-Site and off-Site. The nature and extent of contamination of soil, sediment, surface water and ground water associated with the residue materials, as well as potential risks to human and ecological receptors, were fully characterized in the RI Report.

Soil investigation areas for the RI were established in the SOW and RI/FS Work Plan, including Areas 1 through 4, the Manufacturing Area, the Northern Area, and the Western Area. Areas 1 though 4 were identified by GBI in May 1998 for the purpose of grouping soil samples within areas exhibiting similar physical characteristics, principally areas containing significant concentrations of residue piles.

In the SOW and RI/FS Work Plan, the number of soil borings conducted and frequency of soil samples collected in each area were based on the potential for soil impacts. The largest numbers of soil borings were conducted in Areas 1 through 4, which currently/historically contain(ed) the largest concentrations of residue piles. Twenty-six soil borings were conducted in each of these areas. In all areas, the soil boring locations were randomly selected in accordance with USEPA-approved methodology. Many of the soil borings were collected in close proximity (within approximately 50 feet) to residue piles. The soil samples were collected from the uppermost interval of undisturbed native soil to address potential impacts from the residues.

As discussed in the Phase 2 Technical Memorandum, ENVIRON sampled eight pre-existing monitoring wells, as well as 11 permanent and three temporary monitoring wells installed during Phase 2 of the RI. All of the ground water sample analyses included TAL metals (total and dissolved). The monitoring well locations include areas both proximal to, and down gradient of, the areas with the largest concentrations of residue piles (i.e., Areas 1 through 4). Similarly, sediment and soil samples were collected during the RI at locations within the eastern and western surface water drainageways that are both within and hydraulically down gradient of the areas containing residue piles.

The SPLP data collected from the residue piles during the RI were generally non-detect or indicated very low metals leachate concentrations. While the higher concentrations of metals detected in ground water exist within and down gradient of areas containing residue piles (i.e., in the southwestern portion of the Site), the SPLP data indicate that the residue piles do not represent a significant continuing source of metals to ground water.

In summary, the degree of mobility of metals contained in the residue piles was evaluated in existing soil, sediment, surface water, and ground water data collected during the RI, as well as pre-RI data. These media data were used to estimate potential risks to defined human and ecological receptor populations. Existing on- and off-site soil data represent the sum of release, transfer, and deposition processes related to facility operations and waste management for the past approximately 90 years. Releases to the environment are currently lower than they were in the past because: (1) the facility has ceased operating; and (2) some residue materials have been previously removed from the Site for reprocessing at other zinc facilities. Therefore, it is reasonable to expect that future releases would not exceed those of the past.

3. Sampling Conducted During March 2005

Physical characterization and chemical analyses of the residue piles were conducted in March 2005 and are discussed further in Section III.A. Additional surface soil samples were collected near the northern Site boundary and in the southern portion of the Site in March 2005. These soil samples are discussed further in Section III.B.

C. Residue Pile Conceptual Models

Conceptual models for potential human health and ecological exposure pathways associated with the residue piles are discussed in detail in Sections V and VI of this report, respectively.

III. DATA COLLECTION

Additional soil and residue pile samples were collected at the Site in March 2005. All sampling activities were conducted in accordance with the USEPA-approved sampling methods and quality assurance protocol specified in the RI/FS Work Plan and employed during previous phases of the RI. All chemical analyses were performed by the Enchem, Inc. laboratory in Green Bay, Wisconsin. The particle size analyses were performed by STS Consultants, Ltd. of Vernon Hills, Illinois. Data validation was performed by Trillium, Inc. of Baton Rouge, Louisiana. The laboratory data and data validation reports are submitted under separate cover.

The data collection activities are described below. Sampling information regarding the soil and residue samples collected in March 2005 is provided in Tables III-1 and III-2, respectively. The sampling locations are depicted on Figure III-1.

A. Residue Pile Sampling and Analysis

1. Work Conducted

The following residue pile inspections and sampling activities were conducted on March 11, 2005:

Physical Characterization

Estimates of the degree of crusting/armoring of the residue piles as well as estimates of the percentage of particles constituting "non-erodible elements" (i.e., greater than 1 centimeter in diameter) were made using the methodology specified by Cowherd et al. (1985). This information, as well as other physical characteristics of the piles, is provided on residue pile field forms, included in Appendix B.

TAL Metals Analysis

One residue sample was collected from non-crusted portions of each of the 15 piles/pile groups that were sampled in Phase 1 of the RI. The residue samples were collected from non-crusted portions of the piles, which would be expected to have the greatest potential for emission of particulates. Consistent with the methodology used in the RI, each sample was a composite of six sample increments of approximately equal volumes. Each sample increment was collected from the outermost two to three inches of the pile. The sample increments were thoroughly mixed before placement in the sample containers.

In addition, the fine-grained fraction from each residue sample (that passing a #200 sieve or <75 microns [μm]) was combined at the laboratory into a single composite sample (sample designated "Composite Sample"). Each residue sample, including the composite sample, was analyzed for TAL metals. Field duplicate and matrix spike/matrix spike duplicate (MS/MSD) samples were also collected and analyzed.

Particle Size Distribution

A representative surface grab sample was collected from each residue pile/pile group for particle size distribution and moisture content analyses.

2. Analytical Results

The TAL metals analytical results for the residue pile samples and composite sample are presented in Table III-3. The particle size distribution data for the residue pile samples are presented in Appendix C.

B. Supplementary Soil Sampling

1. Work Conducted

On March 11, 2005, four surface soil samples were collected near the northern Site boundary for analysis of TAL metals. These samples were collected approximately 100 feet south of the northern Site boundary, at approximately equally spaced intervals parallel to Smith Road, see Figure III-1. A field duplicate sample and MS/MSD samples were also collected and analyzed.

On March 16, 2005, four additional on-Site surface soil samples were collected at specific locations in Areas 1 and 2 for TAL metals analysis.[3] As specified by USEPA, these samples were located:

- Near the location of Phase 1 soil boring A1-3,
- At a location approximately mid-way between Phase 1 soil boringsA1-1 and A1-25,
- Near the location of Phase 1 soil boring A2-3, and
- Near the location of Phase 1 soil boring A2-13.

[3] Collection of these additional samples was requested by USEPA in an electronic mail transmission dated March 10, 2005.

As surface soil sample A1-3-S1 appeared to contain a mixture of soil and residue materials, a second soil sample (A1-3-S1-2) was collected at the same location, but at a depth of 0.5 to 1.0 feet below ground surface (bgs). A field duplicate sample and MS/MSD samples were also collected and analyzed.

2. Analytical Results

Surface soil analytical results are presented in Table III-4. Consistent with screening procedures employed for soil data during Phase 1 of the RI (see Section IV.A of the Phase 1 Technical Memorandum), the Illinois TACO Tier I Soil Remediation Objectives (SROs) for commercial/industrial use were used as screening levels for initial evaluation of the soil data.[4]

<u>Northern Area</u>

The zinc concentration detected in sample NA-S2D (7,700 mg/kg) marginally exceeds the screening level of 7,500 mg/kg. However, the average of the zinc concentrations detected in this sample and its field duplicate sample (6,400 mg/kg) was below the Screening Level and both results were below USEPA Region III's RBC for zinc in residential soil of 23,000 mg/kg. In addition, the TACO Screening Level of 7,500 mg/kg is based on soil leaching to ground water. As discussed in the RI Report, there were no adverse ground water impacts in the northern portion of the Site. No other metal concentrations exceeded the screening levels in the Northern Area samples. Therefore, as concluded in the RI Report, soils in the Northern Area at locations down-wind of the residue piles and former manufacturing areas have not been significantly impacted by emissions from the residue piles or any other potential contaminant sources.

<u>Areas 1 and 2</u>

The arsenic concentrations detected in samples A1-26-S1 and A1-3-S1 (12 mg/kg and 21 mg/kg, respectively) exceed the screening level of 11.3 mg/kg. Arsenic was not detected above the screening level in sample A1-3-S1-2, which was collected at the same location as sample A1-3-S1, but six inches deeper. As discussed in previous Site documents, arsenic is not

[4] The more conservative SRO of the SROs for ingestion/inhalation and soil-to-groundwater pathways was used as screening levels in these comparisons. The Illinois non-MSA background concentration was used as the screening level for arsenic as the more conservative SRO is less than background levels.

known to have been used or released at the Site. No other metal concentrations exceeded the Screening Levels.

IV. AIR MODELING AND SOIL DEPOSITION CALCULATIONS

A. Introduction

To evaluate potential risks associated with windborne particles from the residue piles, emission rate calculations, dispersion modeling, and deposition calculations were performed. The methodology for determining emission rates was obtained directly from *AP 42, Fifth Edition, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources,* Chapter 13.2.5, for Industrial Wind Erosion (USEPA, originally dated January 1995, updated April 2001).[5] The dispersion results, as well as the deposition concentration results (discussed in Section IV.D) are further analyzed for human health and ecological risk affects in Sections V and VI, respectively.

B. Emission Rate Calculations

ENVIRON developed the emission rates based on a conservative, "worst-case" approach. Further refinement of emission rates may be warranted if advanced modeling is required. Detailed calculations are provided per residue pile/pile group in Appendix D.

The protocol outlined below describes the steps used in developing the emission rates for each pile. The first three steps of the AP 42 protocol are generic to all piles, as the friction velocity is dependent on wind speed data and not individual pile characteristics.

1. Step 1 was to determine the threshold friction velocity. As a screening exercise, a conservative default value from AP 42 Table 13.2.5-2 was used. The threshold friction velocity for an uncrusted coal pile at 1.12 meters per second (m/s) was applied (**Assumption #1**). If refined modeling is required, pile-specific threshold friction velocities can be developed using particle size distribution data.

2. Step 2 included a determination on the frequency at which the piles are disturbed. Emissions generated by wind erosion are dependent on the frequency of disturbance of the erodible surface. Each time a surface is disturbed (moved, material added, deleted, or leveling of pile); the erosion potential is restored because the action results in the exposure of fresh surface material. As the residue piles have been inactive for a number of years and access to the Site itself is limited to authorized personnel only, ENVIRON had

[5] This information is available on the USEPA Clearinghouse for Inventories & Emissions Factors website: http://www.epa.gov/ttn/chief/ap42/index.html#drafts.

to be conservative and use a hypothetical disturbance frequency. ENVIRON calculated emission rates based on a maintenance disturbance of once per month. Therefore, the number of annual disturbances was set to 12 (**Assumption #2**). Again, to err on the conservative side, it was assumed that the ***entire*** pile surface area is disturbed once per month (**Assumption #3**).

3. Step 3 involved tabulating the fastest mile values for each frequency of disturbance. ENVIRON used readily available wind speed and direction data from the meteorological surface station for the Springfield, Illinois Airport (Station #93822). The base year of 1987 was validated and directly available for use from the Springfield Airport, and thus served as the fastest mile reference year. For each month in the one-year (1987) meteorological data set, the maximum wind speed and its corresponding direction were tabulated as the fastest mile for that month. Since the anemometer height for the Springfield Airport is 9.45 meters (m), it was necessary to correct the fastest mile values to an anemometer height of 10 m, using Equation (5) from AP 42 Chapter 13.2.5. Equation (5) requires a roughness height value. ENVIRON used the default or typical roughness height of 0.5 centimeters (**Assumption #4**).

4. Step 4 included converting the fastest mile values to equivalent friction velocities, taking into account the uniform or non-uniform wind exposure of elevated surfaces.

   i. <u>Height-To-Base Ratio</u>
   ENVIRON first determined the height-to-base ratio of each pile to determine if the pile significantly penetrates the surface wind layer (height-to-base ratio exceeding 0.2) and, therefore, creates a non-uniform wind exposure pattern. If the ratio exceeded 0.2, it was necessary to divide the pile area into sub-areas representing different degrees of exposure to wind. If the height-to-base ratio was 0.2 or less, AP 42 specifies an assumed uniform exposure to wind is generated.

   ii. <u>Uniform Wind Exposure Pattern</u>
   A uniform wind exposure pattern eliminated the need to divide each pile into sub-areas. Therefore, a single equation is applied in the uniform case. Friction velocity is calculated using AP 42 Chapter 13.2.5

Equation (4). If the calculated friction velocity is greater than the threshold friction velocity of 1.12 m/s, then erosion will occur and it is necessary to determine the erosion potential (Step 5 below). However, if the calculated friction velocity is 1.12 m/s or less, then the potential for wind erosion of that pile is negligible. Those piles determined with negligible friction velocities, i.e., no emission rate, were not modeled using SCREEN3 (see Section IV.B).[6]

iii. <u>Non-Uniform Wind Exposure Pattern</u>

AP 42 divides piles into two general shapes (circular and oval) with four corresponding surface contours of normalized surface wind speeds. The shape of the contours for similarly shaped piles is dependent on the wind direction. For each fastest mile and corresponding wind direction, ENVIRON matched the applicable contour map from AP 42 Figure 13.2.5-2, which dictates the ratio of surface wind speed (Us) to approach wind speed (Ur) and matches an appropriate percent of the surface area subject to the applicable Us/Ur ratio. The result was used to determine the friction velocities per Us/Ur ratio.

If the non-uniform wind exposure pattern exists, ENVIRON determined the friction velocities within each isopleth values of Us/Ur. Friction velocity is calculated per disturbance per Us/Ur ratio and per fastest mile, using Equations (6) and (7) from AP 42 Chapter 13.2.5. If the calculated friction velocity is greater than the assumed threshold friction velocity of 1.12 m/s, then erosion will occur and it is necessary to determine the erosion potential (Step 5). However, if the calculated friction velocity is 1.12 m/s or less, then the potential for wind erosion of that pile is negligible. Those piles determined with negligible friction velocities, i.e. no emission rate, were not modeled using SCREEN3 (see Section IV.C).

5. Treating each sub-area (of constant frequency of disturbance and friction velocities) as a separate source, ENVIRON calculated the erosion potential for

[6] SCREEN3 is an USEPA approved single source Gaussian plume model which provides maximum ground-level concentrations for point, area, flare, and volume sources, as well as concentrations in the cavity zone, and concentrations due to inversion break-up and shoreline fumigation.

each period between disturbances. Equation (3) from AP 42 Chapter 13.2.5 was used to determine the erosion potential per Us/Ur ratio.

6. Finally, particulate emissions were calculated by multiply the resulting erosion potential for each sub-area by the size of the sub-area and the applicable particle size multiplier. The emission contributions of all sub-areas are then added to determine the overall pile particulate emission rate for various sized particles. Namely, an emission rate was determined for particles 30 micrometer (μm or micron) or less, 15 μm or less, 10 μm or less, and 2.5 μm or less.

C. Dispersion Modeling

As a screening evaluation, dispersion modeling was conducted using SCREEN3. Modeling was performed using the BREEZE software interface, licensed to ENVIRON by Trinity Consultants (BREEZE AIR SCREEN3 Version 2.04).

As communicated to USEPA prior to the initiation of modeling, the following control options were applied:

- Rural dispersion coefficients
- Regulatory default mixing height
- No fumigation
- No set distance to property line
- Full meteorology conditions
- Area source using the worst-case orientation
- Automated receptor grid from 1 m (absolute minimum value that can be inputted into SCREEN3) to 1,610 m (1 mile)
- No building downwash

As discussed above, the rate of particulate emissions from the residue pile is specific per pile and per particle size. The emission rates corresponding to a 10 μm particle size were used for the inhalation pathway risk assessment, while the emission rates corresponding to a 30 μm particle size were used for the deposition evaluation.

In addition, a number of residue piles were identified with a calculated friction velocity at or below the threshold friction velocity of 1.12 m/s, thus indicating that the potential for wind erosion of the pile is negligible. Those piles determined with negligible friction velocities, i.e., no emission rate, were not modeled using SCREEN3, as an emission rate greater than zero is required to run the model. In all cases where the emission rate was calculated to be negligible, field observations indicated that the pile did not significantly penetrate the surface wind layer due to a height-to-base ratio less than 0.2.

The SCREEN3 dispersion modeling results per residue pile per particle size are presented in Tables IV-1 and IV-2. The SCREEN3 output files are provided in Appendix E and a detailed summary of one-hour concentrations versus distance from the pile is provided in Appendix F. SCREEN3 results are presented as 1-hour average concentrations, as SCREEN3 is not capable of determining annual average concentrations.[7]

D. Deposition Calculations

Soil concentrations in the upper 0- to 6-inch soil horizon were calculated following the methodology outlined in Chapter 5 of the USEPA's *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities*.[8] The deposition flux was estimated using the maximum air concentration calculated using SCREEN3 for each pile. A Stoke's Law settling velocity was calculated assuming a 30 μm diameter particle. The source and values for all input parameters are presented in Table IV-3. The soil-water partition coefficient for each pile/pile group and TAL metal can be found in Table IV-4. For the eight RCRA metals, the SPLP data collected during Phase 1 of the RI and the metals data collected for the RI Addendum sampling were used as model input. For all other metals, literature values for metals in soil were used as model.

Soil concentrations for carcinogens and non-carcinogens were calculated using the following equations:

<u>Carcinogens:</u>

For $T_2 \le tD$:

$$Cs = \frac{Ds}{ks \cdot (tD - T_1)} \cdot \left[\left(tD + \frac{\exp(-ks \cdot tD)}{ks} \right) - \left(T_1 + \frac{\exp(-ks \cdot T_1)}{ks} \right) \right]$$

For $T_1 < tD < T_2$:

$$Cs = \frac{\left(\dfrac{Ds \cdot tD - Cs_{tD}}{ks} \right) + \left(\dfrac{Cs_{tD}}{ks} \right) \cdot (1 - \exp[-ks \cdot (T_2 - tD)]}{(T_2 - T_1)}$$

---

[7] According to USEPA, multiplying factors for "area" sources have not been developed to correctly adjust 1-hour concentrations to annual average concentrations. For fugitive sources modeled with the "area" source algorithm in SCREEN3, USEPA guidance recommends that the maximum 1-hour concentration be conservatively assumed to apply to averaging periods out to 24 hours.

[8] USEPA, 1999a. Methodology suggested in USEPA's letter to ENVIRON dated February 21, 2005.

Noncarcinogens:

$$Cs_{tD} = \frac{Ds \cdot [1 - \exp(-ks \cdot tD)]}{ks}$$

where:

Cs	= Average soil concentration over exposure duration (mg COPC/kg soil)[9]
Ds	= Deposition term (mg COPC/kg soil/yr)
T_1	= Time period at the beginning of deposition (yr)
ks	= COPC soil loss constant due to all processes (yr^{-1})
tD	= Time period over which deposition occurs(yr)
Cs	= Soil concentration at time *tD* (mg/kg)
T_2	= Length of exposure duration (yr)

The COPC soil loss constant due to all processes was calculated using the following equation:

$$ks = ksr + ksl$$

where:

ks	= COPC soil loss constant due to all processes (yr^{-1})
ksr	= COPC loss constant due to surface runoff (yr^{-1})
ksl	= COPC loss constant due to leaching (yr^{-1})

The COPC loss constant due to surface runoff was calculated using the following equation:

$$ksr = \frac{RO}{\theta_{sw} \cdot Z_s} \cdot \left(\frac{1}{1 + (Kd_s \cdot BD / \theta_{sw}} \right)$$

where:

ksr	= COPC loss constant due to surface runoff (yr^{-1})
RO	= Average annual surface runoff from pervious areas (cm/yr)
θ_{sw}	= Soil volumetric water content (mL water/cm^3 soil)
Z_s	= Soil mixing zone depth (cm)
Kd_s	= Soil-water partition coefficient (mL water/g soil)
BD	= Soil bulk density (g soil/cm^3 soil)

The COPC loss constant due to leaching was calculated using the following equation:

[9] COPCs include all the TAL metals.

$$ksl = \frac{P + I - RO - E_v}{\theta_{sw} \cdot Z_s \cdot [1 + (Kd_s \cdot BD / \theta_{sw}]}$$

where:

ksl = COPC loss constant due to leaching (yr^{-1})
P = Average annual precipitation (cm/yr)
I = Average annual irrigation (cm/yr)
RO = Average annual surface runoff from pervious areas (cm/yr)
E = Average annual evapotranspiration (cm/yr)
θ_{sw} = Soil volumetric water content (mL water/cm^3 soil)
Z_s = Soil mixing zone depth (cm)
Kd_s = Soil-water partition coefficient (mL water/g soil)
BD = Soil bulk density (g soil/cm^3 soil)

The runoff term was calculated by the soil conservation method (SCS) as presented in Novotny, 1994:

$$RO = \frac{(P - I_a)^2}{(P - I_a) + S}$$

where:

RO = Average annual surface runoff from pervious areas (cm/yr)
P = Annual precipitation (cm/yr)
I_a = Total infiltration (cm/yr)
S = Initial abstraction (cm/yr)

$$I_a = 0.2 \cdot S$$

and

$$S = \frac{25{,}400}{CN} - 254$$

where:

CN = the runoff curve number

The deposition term was calculated using the following equation:

$$Ds = \frac{M}{Z_s \cdot BD} \cdot 31536000 \cdot 1 \times 10^{-6}$$

where:

Ds = Deposition term (mg COPC/kg soil/yr)
M = Deposition flux (µg CPOC/m^2/sec)
1 x 10^{-6} = Units conversion factor ($\frac{m^3 \cdot g \cdot mg}{cm^3 \cdot kg \cdot \mu g}$)
31536000 = Units conversion factor (sec/yr)

Z_s = Soil mixing zone depth (m)
BD = Soil bulk density (g soil/cm^3 soil)

The deposition flux was calculated by the following equations:

$$M = C_{COPC,air} \cdot v_s$$

where:

M = Deposition flux of COPC (µg/m^2/sec)
$C_{COPC,air}$ = Concentration of COPC in air (µg/m^3)
v_s = Stoke's settling velocity (m/s)

The Stoke's settling velocity was calculated using the following equation:

$$v_s = \frac{g}{18\upsilon}\left(\frac{\rho_p - \rho_f}{\rho_f}\right)d_p^2$$

where:

v_s = Stoke's settling velocity (m/s)
g = Gravitational acceleration (m^2/s)
υ = Kinematic viscosity of air at 25°C (m^2/s)
ρ_p = Density of the particle (kg/m^3)
ρ_f = Density of air at 25°C (kg/m^3)
d_p = Diameter of the particle (m)

E. Nature and Extent of Impacts Based on Modeling

The results of the deposition calculations are presented in Tables IV-5 and IV-6. Based on the methods employed, these results are assumed to be a conservative estimation of potential impacts to surface soils resulting from deposition of windblown particles from the residue piles onto the soil surface. These results are used in the risk assessments presented in Sections V and VI.

V. HUMAN HEALTH RISK EVALUATION FOR RESIDUE PILES

This section presents an addendum to the Human Health Risk Assessment (HHRA) for the Site that was provided in Section VI of the RI Report. As indicated in the RI Report Figure VI-I, the HHRA was premised on the assumption that the residue piles constitute a source of metals to potential exposure media (soil and ground water). The fact that low risk levels were associated with on-Site soil provides strong evidence of the lack of significant impact associated with past and ongoing dust emissions from the residue piles.

The additional material presented in this section has been developed specifically to address issues and questions raised in comments from USEPA communicated subsequent to the submission of the RI Report. In particular, USEPA expressed concern regarding potential human contact with airborne dust from the piles and with dust deposited on adjacent area soils. In its letter of February 21, 2005, USEPA requested that potential exposure and risks associated with the following potential transport mechanisms be considered in the RI Addendum:

- Suspension of wind-blown dust to soils in on- or off-Site locations, and
- Leaching of residue-associated metals to surrounding soils.

In order to address these concerns, samples of residue material as well as supplementary soil samples were collected and analyzed for TAL metals (discussed in Sections III.A and III.B). Modeling of the following transport processes has also been performed:

- Aerial emission of particulate matter (PM) from residue piles (Section IV.B);
- Dispersion of suspended PM (Section IV.C); and
- Deposition of PM in surrounding areas and incorporation into the top six inches of soil (Section IV.D).

Because this is an addendum to the RI, information already presented as part of the HHRA in the RI Report will not be repeated herein, except as necessary to provide the additional information and analysis requested by USEPA. This HHRA addendum was conducted in a manner consistent with the RI/FS Work Plan, the RI Report, and appropriate USEPA guidance used in these documents (USEPA 1989, 2002). However, unlike a standard baseline risk assessment, current Site data have not been used. Rather, hypothetical exposure concentration data have been constructed using a series of conservative, non-site-specific screening models (as described previously). Therefore, the results of this additional assessment can be considered to overestimate potential risks by an unknown factor.

As the methodology used for calculating emission rates in the deposition modeling included disturbance of the entire pile surface area 12 times per year, the assessment of risks presented below takes into consideration the long-term consequences of movement/relocation of the piles to on-Site workers and trespassers. However, the relatively brief exposure of workers disturbing or moving the residue piles is not considered in the HHRA addendum. Potential risks associated with such short-term exposures would be managed through the implementation of a construction health and safety plan and through the application as necessary of standard dust suppression methods. In addition, erosion of the piles during any such short-term disturbance or movement of the piles during construction activities would be controlled through implementation of standard soil erosion and sediment control (SESC) procedures as set forth in a construction SESC Plan.

A. Potentially Complete Exposure Pathways

Potentially complete exposure pathways associated with emissions from the residue piles and the strategy used to address them in this Addendum are summarized in Table V-1. These potential exposure pathways include:

- Inhalation of respirable (≤10 μm aerodynamic diameter) particles emitted from the residue piles;
- Inhalation of respirable particles from the surface soil; and
- Ingestion and dermal contact with surface soil.

B. Selection of Constituents of Potential Concern in Soil

1. Selection of Constituents of Potential Concern Based on Modeled Soil Concentrations

As described in Section IV.D, air modeling results were used to estimate the concentrations in soil resulting from the deposition of particulates originating from the residue piles. Analytes that are common constituents of the earth's crust and of very low potential toxicity (calcium, magnesium, potassium, sodium) were eliminated from consideration. Maximum modeled concentrations of other analytes in soils (Section IV.D) were compared with conservative screening levels to identify analytes that may be of concern (constituents of potential concern, COPCs) as described in Section II.B. of the RI Report, see Table V-2. Screening levels for selection of COPCs in soil and sediment are defined as the higher of Illinois background levels (if available) and USEPA Region III's RBCs for the default residential exposure scenario (USEPA Region III, 2004).

The maximum modeled concentrations did not exceed any of the COPC screening levels, see Table V-2. Therefore, it is concluded that airborne deposition of residue pile material on local soils would not result in any adverse health effects.

2. Selection of Chemicals of Potential Concern in Soil Samples Collected in March 2005

As described in Section III.B, additional soil samples were collected on-Site in March 2005 (see Table III-4). Like the modeled results, the maximum detected concentration of each analyte in these samples was compared to corresponding COPC screening levels (see Table V-3). The only analytes with maximum concentrations in excess of an RBC or background concentration were arsenic, iron, lead, and vanadium. With the exception of lead, all of these analytes were also identified as soil COPCs in the HHRA (see RI Report Table VI-3).

C. Calculation of Residue Pile Screening Levels for Dust Inhalation

Residue pile screening levels (RSLs) for inhalation of airborne particles originating from the piles were calculated for each pile in accordance with the following equation from USEPA guidance (USEPA 2002):

$$RSL_{Inh/RP} = \frac{THQ \text{ or } TR \cdot AT_{nc} \text{ or } AT_{c}}{\frac{1}{RfC} \text{ or } URF \cdot EF \cdot ED \cdot \left(\frac{1}{PEF_{RP}}\right)}$$

This is the same equation as was used in the HHRA (RI Section VI.E.1.c, Equation 5). Equation parameters and their values are presented in Tables V-4 and V-5. However, here the default particulate emission factor (PEF) is replaced with residue pile-specific PEFs (PEF_{RP}) calculated by inverting the maximum modeled one-hour 10 μm particle concentration (see Table IV-1), and converting the units to kg/m^3:

$$PEF_{RP} = \frac{1}{\text{Maximum Modeled Air Concentration}} \cdot 10^9 \frac{\mu g}{kg}$$

As indicated in Table V-5, a number of analytes lacked toxicity criteria; therefore, no RSL could be estimated for them. Residue pile-specific PEFs and RSLs are presented in Table V-6. In several cases, an RSL greater than 1,000,000 mg/kg was calculated, indicating that no concentration of that metal in the pile could result in unacceptable risk.

D. Residue Pile Risk Characterization

1. Potential Risks Associated with Direct Soil Contact Based on March 2005 Soil Data

The concentrations of arsenic, iron, lead, and vanadium detected in the soil samples taken in March 2005 (Table III-4) are similar to those previously taken at the Site. Comparisons of the individual soil concentrations with the corresponding minimum Tier 1 screening levels developed for the industrial worker, construction worker, and trespasser scenarios in the HHRA (RI Report Tables VI-7 through VI-9) are presented in Tables V-7, V-8, and V-9, respectively. For lead, which was not selected as a COPC in the HHRA (RI Report Table VI-3), USEPA's recommended adult (actually, fetal) screening level of 1,235 mg/kg was used (USEPA 2003). Although the Trespasser scenario involves 12- to 17-year olds rather than pregnant adults, application of this value to the Trespasser is considered more appropriate than that for the young residential young child (400 mg/kg) (USEPA 1994) due to their greater similarities in terms of exposure potential and physiology. As in the HHRA, with the exception of arsenic for the industrial worker scenario, none of the March 2005 sampling results exceeded Tier 1 screening levels.

The average concentration of arsenic in the new samples is 7.4 mg/kg. Combining these data with the data set used in the HHRA, a 95% upper confidence limit of 8.1 mg/kg was estimated using ProUCL (gamma distribution) (USEPA 2004), identical to the representative concentration used in the HHRA (RI Report Table VI-8). Therefore, the conclusion reached in the HHRA is reiterated here: "The fact that the representative concentration for arsenic of 8.09 mg/kg is less than the Illinois background concentration of 11.3 mg/kg indicates that this slight exceedance of the target risk level is insignificant."

2. Potential Risks Associated with Inhalation of Respirable Particles Emitted by Residue Piles

The RSLs for each residue pile are compared to the residue pile analytical sample results, see Table V-10. In all cases, the concentrations detected in the residue piles are smaller than the RSLs, indicating that no adverse effects are expected due to the inhalation of particles originating from the residue piles, even if the one-hour maximum concentration were inhaled constantly for 30 years.

E. Conclusions

As discussed in the RI Report, the HHRA conducted for the Eagle Zinc Company Site was predicated on the assumption that the residue piles are an important historical and the only on-going source of COPCs at the site. However, because the piles do not themselves constitute an exposure medium (i.e., they are not soil-like), direct exposure to residue material was not explicitly considered in the HHRA. At the request of USEPA, the screening-level modeling effort documented in this addendum was undertaken in an effort to determine whether airborne emissions from the piles could, under worst-case assumptions, result in unacceptable human exposure and risk. As in the HHRA, the assumptions and models upon which the foregoing analyses are expected to result in over- rather than underestimation of potential exposure and risk. Therefore, the results of this analysis clearly support the conclusion that under current conditions, the residue piles pose no significant cancer risk or non-carcinogenic hazard to the receptor populations considered in the HHRA.

VI. ECOLOGICAL RISK SCREENING EVALUATION

This section presents an addendum to the Ecological Risk Screening Evaluation (ERSE) for the Site that was provided in Section VII of the RI Report. The additional material presented in this section has been developed specifically to provide insight into issues and questions raised in comments from USEPA communicated subsequent to the submission of the RI Report. In particular, USEPA expressed concerns related to terrestrial ecological receptors and their potential exposures to constituents in on-Site residue piles that may be transported away from the piles. In its comments, USEPA stated that the following needed to be considered in the RI Addendum:

- Transport – Uptake and accumulation of residue pile particulates via wind
- Exposure Media – Air, residue pile particulates in soil, and tissue
- Exposure Routes – Inhalation, ingestion, direct contact, and root uptake
- Terrestrial Receptors –Deer mouse, robin, and red-tailed hawk (i.e., the terrestrial receptors evaluated in the RI)

Because this is an addendum to the RI, information already presented as part of the ERSE in the RI Report will not be repeated herein, except as necessary to provide the additional information and analysis requested by USEPA.

This ERSE addendum was conducted in a manner consistent with the RI/FS Work Plan, the RI Report, and appropriate USEPA guidance (USEPA 1997; 1998; 2000; 2001a). However, unlike a standard baseline risk assessment, current Site data have not been used. Rather, hypothetical Site data have been constructed using models (see Section IV). These modeled data serve as input to this ERSE addendum. This ERSE addendum consists of the following steps, abbreviated as appropriate with regard to information previously presented in the RI Report:

- Step 1: Screening-Level Problem Formulation and Ecological Effects Evaluation
- Step 2: Screening-Level Preliminary Exposure Estimate and Risk Calculation

The ecological risk assessment (ERA) process produces a series of clearly defined scientific management decision points (SMDPs). These SMDPs represent critical steps in the process where ecological risk management decision-making occurs. The first SMDP of an ERA typically occurs after Step 2. Generally, the following types of decisions are considered at the SMDPs:

- Whether the available information is adequate to conclude that ecological risks are negligible and, therefore, there is no need for any further action on the basis of ecological risk.
- Whether the available information is not adequate to make a decision at this point, and the ecological risk assessment process will continue.
- Whether the available information indicates a potential for adverse ecological effects, and a more thorough assessment or remediation is warranted.

A. Step 1: Screening-Level Problem Formulation and Ecological Effects Evaluation

1. Screening-Level Problem Formulation

The problem formulation element of an ERA serves to define the reasons for the ERA and the methods for analyzing/characterizing risks, and provides information used to establish the overall goals, breadth, and focus of an ERA (USEPA 1997; 1998). Once this information is established, it is used to develop a conceptual site model for the ERA.

Information pertaining to the screening-level problem formulation has been presented in detail in the RI Report. The comments received by USEPA are considered supplemental to the screening-level problem formulation in that they focus this ERSE addendum on consideration of: windblown particulates from residue piles; exposure via air, particulates in soil, and tissue by inhalation, ingestion, direct contact, and root uptake; and the previously-evaluated terrestrial receptors (deer mouse, American robin, and red-tailed hawk). These potential exposure scenarios, as identified by USEPA, are discussed below. The discussion includes information presented in the RI Report. The results of the information developed below are presented as the conceptual site model.

Source and Transport of Constituents

The source of COPCs is the residue piles located on the Site. The transport mechanism of interest for this ERSE addendum is windblown generation and entrainment of fugitive dust. Air dispersion and deposition modeling have been used to predict concentrations in ambient air and soil.

Exposure Media

The exposure media of potential interest are air, particulates in soil (hereafter referred to as soil), and tissue. Because effects due to exposure to airborne constituents are not well understood for ecological receptors, potential exposures via airborne transport will not be quantified in this addendum.[10] However, exposure to soil and tissue has been quantitatively evaluated as in the RI Report, as discussed below (specifically, via ingestion and food web modeling).

Exposure Routes

The exposure routes that will be quantitatively evaluated are consistent with the exposure media identified above, as well as the routes evaluated in the ERSE. Ingestion and vegetative root uptake, via food web modeling, will be quantitatively evaluated, while inhalation and direct contact will not be quantitatively evaluated. Inhalation is not evaluated for the reasons described previously. Direct contact exposure route is not evaluated because the receptors have dense fur or feathers and this exposure route was not evaluated in the ERSE.

Receptors

The receptors of interest are terrestrial, avian, and mammalian wildlife which, consistent with the ERSE, are the deer mouse, American robin, and red-tailed hawk.

Other elements identified in USEPA's comments that have been considered, insofar as they might impact the screening-level problem formulation, include bioavailability of the COPCs and the potential for exposure via windblown residue pile material being deposited on surface water features. One hundred percent bioavailability is conservatively assumed in this addendum, as in the RI Report. The ERSE shows clearly that water-related risks to terrestrial receptors represent less than one percent of the risk due to ingestion. Therefore, the effects of windblown materials or water-related risks will only be evaluated in this addendum via food web modeling (as in the ERSE).

A conceptual site model for potential ecological exposure pathways and media associated with the residue piles prepared using the information presented above is presented in Figure VI-1.

2. Screening-Level Ecological Effects Evaluation

The screening-level ecological effects evaluation involves the identification of appropriate ecotoxicity screening values (ESVs) for each medium. ESVs are

[10] USEPA's guidance pertaining to ecological risk relative to combustion facilities does not include inhalation as a quantified pathway (USEPA 1999a). Also, this medium was not evaluated in the RI Report.

chemical concentrations in environmental media below which there is negligible risk to receptors exposed to those media (USEPA, 2000). ESVs are available from a broad range of federal and state sources, one or more of which may be applicable for any given site. Further, ESVs for all media and all receptors may not be available from each source; thus, consideration of a range of sources provides greater opportunity for identification of ESVs. The ESVs used in this addendum are the same as those presented in the ERSE, and are described below. Toxicity values used in the ERSE and this addendum are presented in Table VI-1.

The terrestrial mammalian and avian No Observed Adverse Effects Levels (NOAELs) were summarized on Table VII-3 of the RI Report, with more complete documentation presented in Appendix D of the RI (Table D-1b and D-1c, for mammalian and avian receptors, respectively). The avian and mammalian NOAELs are based on the compilation of Sample et al. (1996). These NOAELs are based on chronic exposures to wildlife, and reflect values where diminished survival or diminished reproductive capacity would not be expected, and are based on species-specific food web modeling calculations.

Further, mammalian NOAELs from Sample, et al. (1996) required mathematical extrapolation to provide estimates of deer mouse NOAELs. These mathematical formulae were described in Appendix D, Tables D-1b and D-2a of the RI Report. Avian NOAELs do not require a similar mathematical extrapolation (Sample, et al., 1996). The avian NOAELs are the same, regardless of avian species. The same NOAELs are used for both the American robin and the red-tailed hawk, even though based on a mallard duck study, as identified in Appendix D, Table D-1c of the RI Report.

B. Step 2: Screening-Level Preliminary Exposure Estimate and Risk Calculation

Typically, Step 2 consists of the identification of exposure concentrations and calculation of exposure, followed by the calculation of risk and evaluation of uncertainties. A streamlined approach to developing this information is presented in this addendum, wherein the maximum concentrations estimated by the dispersion and deposition modeling are used for exposure concentrations, and the exposure and risk calculations are performed in a manner that is identical to the calculations presented in the RI Report. The uncertainties pertaining to the ERA remain the same as those identified in the RI Report.

The risk calculations for the deer mouse, robin, and red-tailed hawk are presented on Tables VI-2, VI-3, and VI-4, respectively. As seen on these tables, only one hazard quotient (HQ) exceeds a value of 1 using the maximum modeled concentrations, an HQ of 7 for zinc for the American robin. The HQ for zinc for the American robin using an average of all of the deposition modeling results in conjunction with worst-case exposure assumptions and toxicity values is 2.

C. Scientific Management Decision Point

Concerning potential ecological risks associated with the residue piles, based on the information, data and ecological risk information developed and presented in this addendum, it is concluded that the ecological risks to terrestrial receptors are negligible and, therefore, there is no need for any further action on the basis of ecological risk.

VII. CONCLUSIONS

As discussed in the RI Report, the HHRA conducted for the Eagle Zinc Company Site was predicated on the assumption that the residue piles are an important historical and the only on-going source of COPCs at the site. However, because the piles do not themselves constitute an exposure medium (i.e., they are not soil), direct exposure to residue material was not explicitly considered in the HHRA. At the request of USEPA, the screening-level modeling effort documented in this addendum was undertaken in an effort to determine whether airborne emissions from the piles could, under worst-case assumptions, result in unacceptable human exposure and risk. The results of this analysis clearly support the conclusion that under current conditions, the residue piles pose no significant cancer risk or non-carcinogenic hazard to the receptor populations considered in the HHRA.

Concerning potential ecological risks associated with the residue piles, based on the information, data and ecological risk information developed and presented in this addendum, it is concluded that the ecological risks are negligible and, therefore, there is no need for any further action on the basis of ecological risk.

Furthermore, the SPLP data from the residue piles (generally non-detect or very low metals concentrations) indicate that the residue piles do not represent a significant continuing source of metals to ground water.

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Tables

TABLES

TABLE II-1
Off-Site Soil Samples Collected by IEPA, 1993
Eagle Zinc Company Site
Hillsboro, Illinois

Date			1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993
Sample			X101-B/G	X102-B/G	X104[a]	X106	X107	X108	X109	X110[a]	X111	X112	X113	X114	X115	X116	X117	X118	X119
Parameter	USEPA Region III RBCs (Residential)	95% UCL[c]																	
Aluminum (mg/kg)	**78,000**	**13,604**	12,400	10,000	6,880	13,000	13,000	11,500	10,200	15,000	13,500	9,950	16,600	9,750	14,800	12,500	13,800	1,410	9,390
Antimony (mg/kg)	**31**	**12**	8.9 J	9.2 J	10.6 J	9.4 J	10.5 J	13 J	9.3 J	**7.9** J	**9** J	**10.2** J	**7.8** J	**8.4** J	**11.1** J	**9.9** J	**14.5** J	**10.9** J	**8.3** J
Arsenic (mg/kg)	**0.43**	**9.81**	**5.8**	**5.7**	**6.6**	**6.2**	**8.7**	**13.4**	**4.6**	13.6	8.5	6.2	5.6	11.9	10.5	7.1	8.5	5.9	6.7
Barium (mg/kg)	**5,500**	**204**	230	265	181	224	124	267	130	150	193	233	116	183	181	227	222	106	196
Beryllium (mg/kg)	**160**	**1**	0.8 B	0.81 B	0.49 B	0.63 B	0.72 B	1 B	0.6 B	0.78 B	0.94 B	0.85 B	0.85 B	1	0.8 B	0.93 B	1.7	0.73 B	0.6 B
Cadmium (mg/kg)	**78 (food)**	**4**	--	--	3.2	0.89 B	3.5	11.3	0.71 B	2	1.6	2.8	0.68 B	2.9	1.48	2.3	4.8	--	2.8
Calcium (mg/kg)	**--**	**8,633**	10,600	9,880	598 B	11,600	5,360	5,430	2,580	3,450	8,380	2,800	5,940	4,230	4,970	8,430	19,300	1,720	12,100
Chromium (mg/kg)	**230 (VI)**	**19**	16.2	14.4	10.3	15.1	16.1	23.4	13.4	20.7	20.2	14.8	21.7	15.9	19.4	18.9	17.3	18.5	13.7
Cobalt (mg/kg)	**1,600**	**12**	4.1 B	6.5 B	13.7	11.1	5.6 B	14.8	6.9 B	8.5 B	7.8 B	11.3 B	10.6	5.8 B	7 B	9.8 B	10.6 B	11.1 B	14.9
Copper (mg/kg)	**3,100**	**42**	20 J	19.7 J	30.6 J	24.7 J	36.4 J	104	15.3	22.5	33.8	15.9	22.5	28.3 J	27.8 J	25.5 J	57.2 J	15.9 J	17.5 J
Iron (mg/kg)	**23,000**	**22,007**	14,700	14,400	11,500	15,400	14,900	**33,900**	12,600	20,700	19,300	13,900	20,400	**28,600**	19,700	18,900	21,100	18,200	14,100
Lead (mg/kg)	**400****	**143**	148	236	61	28.5	105	388	47	87.6	70.8	70.1	75.1	137	76.2	147	186	30.4	51.9
Magnesium (mg/kg)	**--**	**2,527**	2,370	2,090	1,040 B	2,150	2,090	1,630	1,530	2,500	1,950	17.6	4,870	1,130	2,030	2,020	2,140	2,120	1,790
Manganese (mg/kg)	**1,600 (non-food)**	**1,149**	434	686	1,180	922	600	**1,670**	660	563	491	**2,070**	568	314	538	851	995	795	1,520
Mercury (mg/kg)	**23[b]**	**0**	0.17	0.18	--	--	0.16	0.16	0.11 B	--	0.11 B	0.11 B	--	--	0.42	0.24	0.14 B	--	0.32
Nickel (mg/kg)	**1,600**	**21**	13.5	11.5	20	14	15.9	35.1	11	15.9	16.5	22.9	18.6	14.4	10.9	16.5	27.5	12.8	14.8
Potassium (mg/kg)	**--**	**1,923**	1,890	1600	491 J	1,060 J	1160 J	--	1,650	1,980	1,920	1,970	2,400	1,040	1,470	1,750	1,460 J	1,210 J	1,670
Selenium (mg/kg)	**39**	**1**	--	1.3 J	0.27 J	--	--	0.84 J	0.31 J	0.49 J	0.42 J	0.39 J	0.27 J	0.76 J	0.52 J	0.53 J	0.35 J	0.27 J	0.55 J
Silver (mg/kg)	**390**	**2**	--	--	--	--	--	--	--	--	--	--	--	--	1.2	--	--	--	--
Sodium (mg/kg)	**--**	**256**	106 B	87.9 B	47.5 B	37.4 B	71.8 B	178 B	65.7 B	62.8 B	120 B	52.4 B	45.8	293 B	61.5 B	89.9 B	1,020 B	--	--
Thallium (mg/kg)	**5.5**	**0.7**	0.33 B	0.34 J	1.2 J	0.26 J	0.35 J	1.4 J	0.28 J	--	0.25 J	0.28 J	0.27 J	0.71 J	0.57 J	0.53 J	0.35 J	0.27 J	0.5 J
Vanadium (mg/kg)	**78**	**37**	28.5	27.1	27.5	28.5	27.3	37.7	24.7	38.7	34.2	28.2	33.7	29.7	34.8	35.1	34.3	34.5 B	26.7
Zinc (mg/kg)	**23,000**	**2,592**	136	138	4,770	1,490	2,480	2,280	360	606	488	489	451	1,580	638	998	7,420	354	1,570

Notes:
mg/kg = milligrams per kilogram.
B = The reported value is less than the CRDL but greater that the instrument detection limit.
J = Estimated value. Used in data validation when the quality control data indicate that a value may not be accurate.
-- = Not detected.
Concentrations exceeding RBCs are highlighted in **bold**.
[a]While technically located on-site sample x104 is grouped with other 1993 off-site samples and hence had been compared to more stringent residential values. Source: 1993 CERCLA Expanded Site Inspection Report.
[b] USEPA Region IX PRG.
[c] The background sample data were excluded from the 95% UCL calculations.

Table I-1: Summary of Historical Site Investigations

Dates	Sampler	Locations	Media	No. Samples	Analytical Parameters	On/Off Site	Purpose
1980-1982	IEPA	Surface Runoff Areas	Storm Water	Unknown	Metals	On-Site	IEPA Stormwater Runoff Concerns
Oct-93	IEPA	On-Site/Off-Site Areas	Soil, Residuals, Sediments	Soil - 19; Sediment - 8; Residuals - 2	Soils-TAL Inorganics; Sediments-Full TCL/TAL List	On-Site/Off-Site	CERCLA/HRS Ranking Data Requirements
May-98	GBI; IEPA Split	On-Site Soils; residual piles	Soil, Residuals	Soils - 44; Residuals - 68	Lead, Cadmium (also selected samples for TCLP lead and cadmium)	On-Site	Interim Consent Order Requirements
Jul-98	GBI; IEPA Split	Outfalls 001 and 002[2]	Storm Water	4	Selected Metals, Other Inorganics, Physical Parameters	On-Site	NPDES Permitting
Dec-98	GBI; IEPA Split	Site Monitoring Wells	Ground Water	10	35 IAC Part 620.410 Inorganic and Organic Parameters	On-Site	Ground Water Assessment

[1] As per 1993 IEPA CERCLA Expanded Site Inspection Report and 1982 Environmental Risk Assessment.

[2] Outfall 002 also sampled monthly pursuant to general storm water permit

GBI - Goodwin & Broms, Inc.
IEPA - Illinois Environmental Protection Agency

TABLE III-1
Soil Sampling Information, March 2005
Eagle Zinc Company Site
Hillsboro, Illinois

Soil Area	Sample Date	Soil Sample ID	Sample Depth (ft)	Lab Analyses
Area 1	3/16/05	A1-3-S1	0-0.5	TAL Metals
Area 1	3/16/05	A1-3-S1-2	0.5-1.0	TAL Metals
Area 1	3/16/05	A1-26-S1[a]	0-0.5	TAL Metals
Area 3	3/16/05	A2-3-S1	0-0.5	TAL Metals
Area 3	3/16/05	A2-3-S1D	0-0.5	TAL Metals
Area 3	3/16/05	A2-13-S1	0-0.5	TAL Metals
Northern Area	3/11/05	NA-S1	0-0.5	TAL Metals
Northern Area	3/11/05	NA-S2	0-0.5	TAL Metals
Northern Area	3/11/05	NA-S2D	0-0.5	TAL Metals
Northern Area	3/11/05	NA-S3[a]	0-0.5	TAL Metals
Northern Area	3/11/05	NA-S4	0-0.5	TAL Metals

Notes:
ft = feet
TAL = Target Analyte List
A2-3-S1D and NA-S2D collected as duplicate samples.
[a]Designated as matrix spike/matrix spike duplicate (MS/MSD).

TABLE III-2
Residue Pile Sampling Information, March 2005
Eagle Zinc Company Site
Hillsboro, Illinois

Lab Sample Number	Residue Type	Lab Analyses[b]
RR1-1	RR1	TAL Metals, Particle Size
RR1-2	RR1	TAL Metals, Particle Size
RR1-3	RR1	TAL Metals, Particle Size
RCO-5	RCO	TAL Metals, Particle Size
CPH-6	CPH	TAL Metals, Particle Size
CPH-9	CPH	TAL Metals, Particle Size
RCO-10	RCO	TAL Metals, Particle Size
RR2-11[a]	RR2	TAL Metals, Particle Size
RRO-12	RRO	TAL Metals, Particle Size
RRO-12D	RRO	TAL Metals, Particle Size
RR1-4	RR1	TAL Metals, Particle Size
NP-13	unk	TAL Metals, Particle Size
NP-14	unk	TAL Metals, Particle Size
NP-15	MP	TAL Metals, Particle Size
NP-16	RRO	TAL Metals, Particle Size
Composite Sample	All[c]	TAL Metals
MP-21	MP	TAL Metals, Particle Size

Notes:
RR1 = Rotary Residue Type 1
RR2 = Rotary Residue Type 2
RCO = Rotary clean ou
RRO = Rotary Residue Oversized
CPH = Carbon Plant Hutch
MP = Miscellaneous Piles
unk = Unknown pile type
RRO-12D = collected as a duplicate sample
[a]Designated as matrix spike/matrix spike duplicate (MD/MSD).
[b]TAL metal samples collected from the surface of each pile/pile group as a 6-point composite. Particle size samples collected from the surface of each pile/pile group at a single representative location.
[c]Composite of the size fraction from each of the 15 residue samples that passed through a #200 sieve (< 75 microns).

Table III-3
Residue Pile Sampling Analytical Results, March 2005
Eagle Zinc Company Site
Hillsboro, Illinois

Sample ID	COMPOSITE SAMPLE	CPH-6	CPH-9	MP1-21	NP-13	NP-14	NP-15	NP-16	RCO-10	RCO-5	RRO-12D	RRO-12	RR1-1	RR1-2	RR1-3	RR1-4	RR2-11
Parameter (mg/kg)																	
Aluminum	12,000	7,000 J	3,800 J	5,700	8,300 J	3,900 J	9,600 J	6,000 J	20,000 J	8,300 J	11,000	7,700 J	5,300	7,300	4,500 J	6,000 J	35,000 J
Antimony	R	8.3	16 U	190 J	17 U	16 U	110	3.8 J	190	6.5	17 UJ	41	16 UJ	16 UJ	16 U	16 U	400
Arsenic	55	33 J	8.1 J	200	5.7 J	3.1 J	11 J	12 J	41 J	19 J	15	11 J	9.1	6.8	16 J	7.9 J	21 J
Barium	220	210	150	870	290	210	110	130	350	230	420	170	160	130	480	150	130
Beryllium	1.1 J	1.3	0.68	0.84	1.2	0.66	0.97	0.86	2.4	2.9	2	1.6	1.1	0.79	0.86	0.89	1.5
Cadmium	22	10 U	6.1 U	50	23 U	32 U	19 U	15 U	24 U	21 U	10	6.9 U	5.6	9.4	35 U	4.9 U	7.2 U
Calcium	5,600	9,900 J	7,500 J	2,100	5,000 J	1,900 J	8,200 J	16,000 J	20,000 J	17,000 J	19,000	17,000 J	6,200	3,500	950 J	9,400 J	3,300 J
Chromium	50	10	4.4	22 J	11	4.9	62	22	220	30	38 J	47	8.6 J	9.2 J	12	6.8	290
Cobalt	630	250	440	110	8.2	4.4	500	430	760	570	560	440	140	70	9.7	880	93
Copper	3,700	2,400 J	2,100 J	3,600	190 J	140 J	1,900 J	1,900 J	24,000 J	2,200 J	3,400	2,200 J	3,400	2,000	400 J	2,600 J	34,000 J
Iron	82,000	110,000	47,000	110,000	24,000	5,500	31,000	36,000	60,000	25,000	73,000	48,000	75,000	60,000	88,000	72,000	77,000
Lead	7,100	800	79	31,000	76	74	1,200	550	2,500	530	520	810	450	250	1,600	120	7,700
Magnesium	3,200	4,200 J	4,400 J	1,000 J	700 J	570 J	3,000 J	3,800 J	5,400 J	3,800 J	5,200 J	4,700 J	3,400 J	1,400 J	340 J	6,000 J	1,200 J
Manganese	2,500	910	330	8,300 J	490	65	510	1,100	880	570	1,300 J	930	330 J	190 J	160	290	750
Mercury	0.43	0.43	0.046	0.065	0.028	0.036	0.10	0.23	0.024	0.056	0.047	0.090	0.053	0.038	0.075	0.038	0.012
Nickel	1,600	650	610	59	21	10	1,300	800	7,000	1,100	1,100	1,000	790	610	22	890	10,000
Potassium	660	1,300 J	770 J	140 J	600 J	240 J	410 J	640 J	1,400 J	470 J	1,300 J	700 J	770 J	490 J	340 J	630 J	230 J
Selenium	15 U	6.9 J	4.4 J	4.7	1.8 J	2.8 J	8.1 J	5.7 J	4.8 J	5.8 J	5.5	4.0 J	5.7	4.7	1.7 J	3.5 J	3.6 J
Silver	58	14	48	140	0.39	0.48	9.5	21	43	13	34	18	8.9	3.9	1.8	77	29
Sodium	1,600	340 J	450 J	51	460 J	220 J	170 J	1,100 J	810 J	730 J	1,700	1,100 J	230	200	130 J	340 J	250 J
Thallium	8.4	0.31 UJ	0.32 UJ	0.11 J	0.24 J	0.070 J	0.12 J	0.11 J	0.085 J	0.098 J	0.05 J	0.11 J	0.32 U	0.053 J	0.098 J	0.32 UJ	1.0 J
Vanadium	34	11	12	21	29	12	9.8	18	14	15	20	17	12	12	27	10	5.7
Zinc	180,000	190,000	170,000	39,000	25,000	39,000	180,000	150,000	130,000	200,000	150,000	120,000	210,000	190,000	7,700	130,000	140,000

Notes:
mg/kg = milligrams per kilogram
U = The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limits
J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the samples
R = The data are unusable. The sample result are rejected to serious deficiencies in meeting Quality Control criteria. The analyte may or may not be present in the sample
UJ = The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise

Table III-3: Residue Sampling Summary

Lab Sample Number	Residue Pile ID from RI/FS Workplan	Residue Type	Lab Analyses	Volume Estimates (cu.yds.)	Comments
R-RR1-1	1	RR1	TCLP/SPLP	1,400	--
R-RR1-2	2	RR1	TCLP/SPLP	2,300	--
R-RR1-3	3	RR1	TCLP/SPLP	1,100	--
R-RR1-4/ R-RR1-4D	4	RR1	TCLP/SPLP	2,700	--
R-RCO-5	5	RCO	TCLP/SPLP	3,200	--
R-CPH-6	6	CPH	TCLP/SPLP	800	--
R-CPH-9	9	CPH	TCLP/SPLP	800	--
R-RCO-10	10	RCO	TCLP/SPLP	4,500	--
R-RR2-11*	11	RR2	TCLP/SPLP	8,000	--
R-RRO-12	12	RRO	TCLP/SPLP	11,600	--
R-NP-13	14,15,16	unk	TCLP/SPLP	400	These piles were grouped for sampling because of their small size, proximity and similar appearance.
R-NP-14	17,18,19,20	unk	TCLP/SPLP	500	These piles were grouped for sampling because of their small size, proximity and similar appearance.
R-NP-15	NI	MP	TCLP/SPLP	1,100	This pile was not identified in the RI/FS Work Plan. Based on its appearance this appears to be an older pile.
R-NP-16	NI	RRO	TCLP/SPLP	5,000	This pile was not identified in the RI/FS Work Plan. This is a newer pile which has accumulated as a result of on-site residue processing.
R-MP-21	21	MP	TCLP/SPLP	500	--

* Designated as MS/MSD
R-RR1-4D collected as a duplicate sample
NI = Residue pile not identified in RI/FS Workplan

RR1 = Rotary Residue Type 1
RR2 = Rotary Residue Type 2
RCO = Rotary Clean Out
RRO Rotary Residue Oversized
CPH = Carbon Plant Hutch
MP = Miscellaneous Piles
unk = Unknown pile type

Table III-4
Surface Soil Analytical Results, March 2005
Eagle Zinc Company Site
Hillsboro, Illinios

Sample ID	A1-26-S1	A1-3-S1	A1-3-S1-2	A2-13-S1	A2-3-S1	A2-3-S1D	NA-S1	NA-S2	NA-S2D	NA-S3	NA-S4
Depth	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"
Parameter (mg/kg)											
Aluminum	19,000 J	18,000 J	21,000 J	9,800 J	11,000 J	11,000 J	11,000	8,400	8,600	11,000	7,600
Antimony	18 UJ	5.4 J	1.8 UJ	18 UJ	19 UJ	18 UJ	19 UJ	19 UJ	21 UJ	19 UJ	20 UJ
Arsenic	12	21	4.5	2.3	11	7.4	7.3	4	4.8	3.7	3
Barium	190	150	110	150	160	150	160	120	93	150	84
Beryllium	0.8	0.71	1.0	0.65	0.78	0.65	0.56	0.46	0.58	0.53	0.38
Cadmium	7.3 J	7.8 J	4.7 J	5.8 J	7.7 J	7.3 J	2.5	5.9	7.7	2.7	1.5
Calcium	1,000	1,000	1,600	1,800	650	670	8,500	1,100	1,500	2,300	1,700
Chromium	21 J	22 J	23	13 J	15 J	15 J	14 J	11 J	13 J	13 J	9.7 J
Cobalt	13	12	6.0	3.3	18	8	8.3	4.2	6.6	3.7	2.9
Copper	130 J	180 J	12 J	27 J	7.7 J	12 J	20	67	170	19	10
Iron	27,000	25,000	19,000	8,100	16,000	12,000	14,000	9,000	10,000	11,000	7,300
Lead	500	1,100	24	26	30	29	87	120	230	40	31
Magnesium	2,200 J	2,700 J	2,500 J	990 J	1,400 J	1,400 J	1,300 J	1,000 J	1,100 J	1,200 J	920 J
Manganese	540	490	190	160	960	400	1,000 J	260 J	320 J	260 J	280 J
Mercury	0.042	0.028	0.041	0.034	0.02	0.023	0.02	0.031	0.05	0.019	0.015
Nickel	42 J	18 J	16 J	8.0 J	11 J	9.2 J	11	11	37	9.6	6.6
Potassium	1,300 J	1,400 J	670 J	840 J	900 J	940 J	910 J	730 J	750 J	870 J	810 J
Selenium	0.99 J	1.1 J	0.64 J	0.81 J	1.2	0.88 J	0.89 J	0.88 J	1.1 J	0.59 J	0.62 J
Silver	0.97	3.4	0.054 J	0.10	0.056 J	0.05 J	0.26	0.22	0.38	0.11	0.1 J
Sodium	53	41	73	98	70	66	36	47	58	37	33
Thallium	0.35	0.31	0.17 J	0.19 J	0.35	0.37	0.2	0.17	0.17 J	0.16	0.13 J
Vanadium	39	42	33	23	40	33	32	21	22	28	19
Zinc	4,800 J	2,700 J	93 J	770 J	460 J	710 J	1,600	5,100	7,700	1,500	950

Notes:

mg/kg = milligrams per kilograms

U = The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limits

J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the samples

R = The data are unusable. The sample result are rejected to serious deficiencies in meeting Quality Control criteria. The analyte may or may not be present in the sample

UJ = The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise

TABLE IV-1
Dispersion Model Results: 10 Micron, One-Hour Concentration Results
Eagle Zinc Company Site
Hillsboro, Illinois

Pile ID	Maximum Concentration ($\mu g/m^3$)	Distance to Maximum Concentration (m)[b]
CPH-6	0.07662	90
CPH-9	0.07988	51
MP1-21	Not Modeled[a]	NA
NP-13	Not Modeled[a]	NA
NP-14	Not Modeled[a]	NA
NP-15	0.25070	74
NP-16	0.08302	73
RCO-10	0.12110	58
RCO-5	Not Modeled[a]	NA
RR1-1	Not Modeled[a]	NA
RR1-2	Not Modeled[a]	NA
RR1-3	1.31300	47
RR1-4	Not Modeled[a]	NA
RR2-11	0.20130	88
RRO-12	0.73220	95

Notes:
$\mu g/m^3$ = micrograms per cubic meter
m = meter
NA = Not Analyzed
[a] The calculated friction velocity was less than or equal to the threshold friction velocity. Therefore, no emissions due to wind erosion occur.
[b] None of the distances from the pile/pile group to the maximum concentration extend off-Site.

TABLE IV-2
Dispersion Model Results: 30 Micron, One-Hour Concentration Results
Eagle Zinc Company Site
Hillsboro, Illinois

Pile ID	Maximum Concentration ($\mu g/m^3$)	Distance to Maximum Concentration (m)
CPH-6	0.1530	90
CPH-9	0.1595	51
MP1-21	Not Modeled[a]	NA
NP-13	Not Modeled[a]	NA
NP-14	Not Modeled[a]	NA
NP-15	0.5006	74
NP-16	0.1658	73
RCO-10	0.2417	58
RCO-5	Not Modeled[a]	NA
RR1-1	Not Modeled[a]	NA
RR1-2	Not Modeled[a]	NA
RR1-3	2.6360	47
RR1-4	Not Modeled[a]	NA
RR2-11	0.4039	88
RRO-12	1.4690	95

Notes:
$\mu g/m^3$ = micrograms per cubic meter
m = meter
NA = Not Analyzed
[a] The calculated friction velocity was less than or equal to the threshold friction velocity. Therefore, no emissions due to wind erosion occur.

TABLE IV-3
Parameter Input Values for Deposition Calculations
Eagle Zinc Company Site
Hillsboro, Illinois

Parameter	Description	Value	Units	Source
T_1	Time period at the beginning of deposition	0	yr	Assumed
tD	time period over which deposition occurs	30	yr	Assumed
T_2	Length of exposure duration	70	yr	Assumed
P	Annual Average Precipitation	92.5	cm/yr	Figure 4, Baes and Sharp, 1983
I	Average annual irrigation	3	cm/yr	Figure 5, Baes and Sharp, 1983
E_v	average annual evapotranspiration	67.5	cm/yr	Figure 6, Baes and Sharp, 1983
CN	Curve number	61	-	Table 3.9, Novotny, 1994
θ_{sw}	Soil volumetric water content	0.2	ml/cm^3	Chapter 5, EPA, 1998
Z_s	Soil Mixing depth	15.24	cm	EPA letter dated Feburary 21, 2005
BD	Soil Bulk Density	1.5	g soil/cm^3 soil	Chapter 5, EPA, 1998
g	gravitional acceleration	9.8	m^2/s	
υ	kinematic ciscosity of air at 25°C	1.51×10^{-5}	m^2/s	Clark, 1996
ρ_p	density of the particle	1939	kg/m^3	Bulk Density data collected pre-RI
ρ_f	density of the air at 25°C	1.184	kg/m^3	Clark, 1996
d_p	Diameter of the particle	30	μm	EPA letter dated Feburary 21, 2005

Table IV-4
Partition Coefficients (Kd_s)
Eagle Zinc Company Site
Hillsboro, Illinois

Analyte	Pile															Source
	RR1-3	RR2-11	RCO-10	RR1-4	CPH-6	CPH-9	RCO-5	MP1-21	RR1-1	RR1-2	RRO-12	NP-13	NP-14	NP-15	NP-16	
Aluminum	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	Average
Antimony	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	EPA, 1998
Arsenic	2,133	2,800	5,467	1,053	4,400	1,080	2,533	26,667	1,213	907	1,467	760	413	1,467	1,600	Caclulated from SPLP and TAL data
Barium	5,393	1,000	2,917	6,250	3,684	1,923	3,382	14,746	1,455	1,667	2,698	15,263	6,000	1,594	2,031	Caclulated from SPLP and TAL data
Beryllium	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	EPA, 1998
Cadmium	778	4,800	533	3,267	222	4,067	14,000	658	1,600	2,186	4,600	15,333	1,882	12,667	10,000	Caclulated from SPLP and TAL data
Calcium	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	Baes and Sharp, 1983
Chromium	8,000	193,333	146,667	4,533	6,667	2,933	20,000	14,667	5,733	6,133	31,333	7,333	3,267	41,333	14,667	Caclulated from SPLP and TAL data
Cobalt	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	EPA, 1999
Copper	3,981	3,981	3,981	3,981	3,981	3,981	3,981	3,981	3,981	3,981	3,981	3,981	3,981	3,981	3,981	EPA, 1999
Iron	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	Baes and Sharp, 1983
Lead	320,000	1,540,000	500,000	24,000	160,000	15,800	106,000	50,000	90,000	50,000	162,000	15,200	14,800	240,000	110,000	Caclulated from SPLP and TAL data
Magnesium	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	Baes and Sharp, 1983
Manganese	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	Baes and Sharp, 1983
Mercury	750	120	240	380	4,300	460	560	650	530	380	900	280	360	1,000	2,300	Caclulated from SPLP and TAL data
Nickel	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	EPA, 1998
Potassium	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	Baes and Sharp, 1983
Selenium	227	480	640	467	920	587	773	733	760	627	533	240	373	1,080	760	Caclulated from SPLP and TAL data
Silver	720	11,600	17,200	30,800	5,600	19,200	5,200	56,000	3,560	1,560	7,200	156	192	3,800	8,400	Caclulated from SPLP and TAL data
Sodium	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	Average
Thallium	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	EPA, 1998
Vanadium	501	501	501	501	501	501	501	501	501	501	501	501	501	501	501	EPA, 1999
Zinc	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	EPA, 1998

Table IV-5
Modeled Soil Concentrations- Noncarcinogens
Eagle Zinc Company Site
Hillsboro, Illinois

Analytes	Pile ID / Maximum	RR1-3	RR2-11	RCO-10	RR1-4	CPH-6	CPH-9	RCO-5	MP1-21	RR1-1	RR1-2	RRO-12	NP-13	NP-14	NP-15	NP-16
Aluminum	3.1	2.6	3.1	1.1	NA	0.2	0.1	NA	NA	NA	NA	2.5	NA	NA	1.1	0.2
Antimony	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Arsenic	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Barium	0.3	0.3	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.1	NA	NA	0.0	0.0
Beryllium	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Cadmium	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Calcium	1.4	0.1	0.1	0.3	NA	0.1	0.1	NA	NA	NA	NA	1.4	NA	NA	0.2	0.2
Chromium	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Cobalt	0.1	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.1	NA	NA	0.1	0.0
Copper	3.0	0.2	3.0	1.3	NA	0.1	0.1	NA	NA	NA	NA	0.7	NA	NA	0.2	0.1
Iron	50.0	50.0	6.7	3.1	NA	3.6	1.6	NA	NA	NA	NA	15.2	NA	NA	3.3	1.3
Lead	0.9	0.9	0.7	0.1	NA	0.0	0.0	NA	NA	NA	NA	0.3	NA	NA	0.1	0.0
Magnesium	0.5	0.1	0.0	0.1	NA	0.0	0.1	NA	NA	NA	NA	0.5	NA	NA	0.1	0.0
Manganese	0.3	0.1	0.1	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.3	NA	NA	0.1	0.0
Mercury	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Nickel	0.9	0.0	0.9	0.4	NA	0.0	0.0	NA	NA	NA	NA	0.3	NA	NA	0.1	0.0
Potassium	0.1	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.1	NA	NA	0.0	0.0
Selenium	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Silver	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Sodium	0.4	0.1	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.4	NA	NA	0.0	0.0
Thallium	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Vanadium	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Zinc	29.2	3.4	9.4	5.2	NA	4.8	4.5	NA	NA	NA	NA	29.2	NA	NA	14.9	4.1

Notes:
All soil concentrations in milligrams per kilogram (mg/kg).
NA = Not Analyzed.

Table IV-6
Modeled Soil Concentrations - Carcinogens
Eagle Zinc Company Site
Hillsboro, Illinois

Analytes	Pile ID Maximum	RR1-3	RR2-11	RCO-10	RR1-4	CPH-6	CPH-9	RCO-5	MP1-21	RR1-1	RR1-2	RRO-12	NP-13	NP-14	NP-15	NP-16
Aluminum	2.4	2.0	2.4	0.8	NA	0.2	0.1	NA	NA	NA	NA	1.9	NA	NA	0.8	0.2
Antimony	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Arsenic	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Barium	0.2	0.2	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Beryllium	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Cadmium	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Calcium	0.6	0.1	0.0	0.1	NA	0.0	0.0	NA	NA	NA	NA	0.6	NA	NA	0.1	0.1
Chromium	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Cobalt	0.1	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.1	NA	NA	0.0	0.0
Copper	2.3	0.2	2.3	1.0	NA	0.1	0.1	NA	NA	NA	NA	0.6	NA	NA	0.2	0.1
Iron	38.6	38.6	5.2	2.4	NA	2.8	1.2	NA	NA	NA	NA	11.7	NA	NA	2.6	1.0
Lead	0.7	0.7	0.5	0.1	NA	0.0	0.0	NA	NA	NA	NA	0.2	NA	NA	0.1	0.0
Magnesium	0.2	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.2	NA	NA	0.1	0.0
Manganese	0.2	0.1	0.1	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.2	NA	NA	0.0	0.0
Mercury	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Nickel	0.7	0.0	0.7	0.3	NA	0.0	0.0	NA	NA	NA	NA	0.2	NA	NA	0.1	0.0
Potassium	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Selenium	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Silver	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Sodium	0.3	0.1	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.3	NA	NA	0.0	0.0
Thallium	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Vanadium	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Zinc	18.4	2.1	5.9	3.3	NA	3.0	2.8	NA	NA	NA	NA	18.4	NA	NA	9.4	2.6

Notes:
All soil concentrations in milligrams per kilogram (mg/kg).
NA = Not Analyzed.

TABLE V-1
Summary of Potential Exposure Pathways Considered in the HHRA Addendum
Eagle Zinc Company Site
Hillsboro, Illinois

Potential Exposure Medium	Potential Exposure Route	Data Used to Evaluate	Method of Evaluation
Respirable emissions from residue pile	Particle inhalation	Emission/ dispersion modeling, residue analytical data	Metals concentration data from piles compared with pile-specific residue screening levels back-calculated based on USEPA inhalation toxicity criteria, modeled respirable dust concentration, and residential exposure assumptions
Surface soil (residue pile emission deposition modeling)	Particle inhalation Ingestion Dermal contact	Emission/ dispersion/ deposition modeling, residue analytical data	• Maximum modeled or measured metals concentrations in soil screened against COPC screening levels (USEPA Region III residential RBCs and Illinois regional background levels), as in the HHRA (see Section II.B of the RI Report). • Results exceeding these COPC screening levels compared to Tier 1 risk-based screening levels for soil developed in the HHRA for on-Site receptors: Commercial/Industrial Workers, Construction Workers, and Trespassers.
Surface soil	Particle inhalation Ingestion Dermal contact	Soil data collected March 2005	

Notes:
COPC = Constituents of Potential Concern
RBCs = Risk Based Concentrations
HHRA = Human Health Risk Assessment

TABLE V-2

Comparison of Maximum Modeled Soil Concentrations with COPC Screening Levels [a]
Eagle Zinc Company Site
Hillsboro, Illinois

Analyte	USEPA Region III Residential Soil RBC [b] (mg/kg)	Illinois Background [c] (mg/kg)	Maximum Modeled Concentration (mg/kg)
Aluminum	78,000	9,200	3.1
Antimony	31	3.3	0.024
Arsenic	0.43	11.3	0.0092
Barium	5,500	122	0.28
Beryllium	160	0.56	0.00052
Cadmium	78	0.5	0.0097
Chromium	230		0.026
Cobalt	1,600	8.9	0.14
Copper	3,100	12	3
Iron	23,000	15,000	50
Lead [d]	400	20.9	0.93
Manganese	1,600	630	0.30
Mercury	23		0.000042
Nickel	1,600		0.880
Selenium	390		0.0013
Silver	390		0.0058
Thallium	5.5		0.000074
Vanadium	78		0.015
Zinc	23,000		29

Notes:

mg/kg = milligrams per kilogram

[a]As defined in the HHRA (RI Report Section II.B).

[b]Data obtained from http:www.epa.gov/reg3hwmd/risk/human/index.htm.

[c]As specified in Table G of Appendix A of 35 Illinois Administrative Code 742.

[d]Value for lead obtained from USEPA (2002b).

TABLE V-3
Comparison of Maximum Detected Concentrations
in March 2005 Soil Samples with Screening Levels[a]
Eagle Zinc Company Site
Hillsboro, Illinois

Analyte	USEPA Region III Residential Soil RBC [b] (mg/kg)	Illinois Background [c] (mg/kg)	Maximum Measured Concentration (mg/kg)
Aluminum	78,000	9,200	21,000
Antimony	31	3.3	21
Arsenic	0.43	11.3	***21***
Barium	5,500	122	190
Beryllium	160	0.56	1
Cadmium	78	0.5	7.8
Chromium	230		23
Cobalt	1,600	8.9	18
Copper	3,100	12	180
Iron	23,000	15,000	***27,000***
Lead [d]	400	20.9	***1,100***
Magnesium	420,000	2,700	2,700
Manganese	1,600	630	1,000
Mercury	23		0.05
Nickel	1,600		42
Selenium	390		1.20
Silver	390		3.4
Thallium	6.30		0.37
Vanadium	23		***42***
Zinc	23,000		7,700

Notes:

mg/kg = milligrams per kilogram

Designates exceedance of COPC screening level.

[a]As defined in the HHRA (RI Section II.B).

[b]Data obtained from http:www.epa.gov/reg3hwmd/risk/human/index.htm.

[c]As specified in Table G of Appendix A of 35 Illinois Administrative Code 742.

[d]Value for lead obtained from USEPA (2002b).

TABLE V-4
Exposure Parameter Values Used to Calculate Residue Pile Screening Levels[a]
Eagle Zinc Company Site
Hillsboro, Illinois

Parameter	Value	Units	Description
RSL_{Inh}		mg/kg	Residue Screening Level for inhalation of respirable particles originating from the pile
AT_c	25,550	days	Default lifetime
AT_{nc}	= ED x 365	days	
URF		$(mg/m^3)^{-1}$	Inhalation unit risk factor [chemical-specific; see Table V-3]
RfC		mg/m^3	Inhalation reference concentration [chemical-specific; see Table V-3]
EF	350	days/yr	Default residential exposure frequency
ED	30	yrs	Default residential exposure duration
PEF_{RP}		m^3/kg	Residue pile-specific particulate emission factor
THQ	1	unitless	Target hazard quotient
TR	10^{-6}	unitless	Target cancer risk level

Notes:

[a]Except as indicated, all values are defaults taken from USEPA (2002).

TABLE V-5
Inhalation Toxicity Criteria Used to Calculate Residue Pile Screening Levels[a]
Eagle Zinc Company Site
Hillsboro, Illinois

Analyte	RfC (mg/m^3)	URF (m^3/mg)
Aluminum	0.005	No URF
Antimony [b]	0.0002	No URF
Arsenic	No RfC	4.3
Barium	0.0005	No URF
Beryllium	No RfC	2.4
Cadmium	No RfC	1.8
Chromium [c]	0.0001	12
Cobalt	0.00002	2.8
Copper	No RfC	No URF
Iron	No RfC	No URF
Lead	No RfC	No URF
Manganese	0.00005	No URF
Mercury	0.0003	No URF
Nickel [d]	No RfC	0.24
Selenium	No RfC	No URF
Silver	No RfC	No URF
Thallium	No RfC	No URF
Vanadium	No RfC	No URF
Zinc	No RfC	No URF

Notes:
RfC = Reference Concentration
URF = Unit Risk Factor
mg/m^3 = milligrams per cubic meter
m^3/mg = cubic meter per milligram
[a]From IRIS (USEPA 2005).
[b]Antimony as antimony trioxide.
[c]Chromium as hexavalent chromium.
[d]Nickel as nickel refinery dust.

TABLE V-6
Residue Pile-Specific PEFs and Screening Levels
Eagle Zinc Company Site
Hillsboro, Illinois

Residue Pile:	RR2-11		RCO-10		RR1-3		CPH-9		CPH-6		RRO-12		NP-15		NP-16	
PEF_{RP} (m^3/kg):	4.97E+09		8.26E+09		7.62E+08		1.25E+10		1.31E+10		1.37E+09		3.99E+09		1.20E+10	
Analyte	SSL (NC)	SSL (C)	SSL (NC)	SSL (C)	SSL (NC)	SSL (C)	SSL (NC)	SSL (C)	SSL (NC)	SSL (C)	SSL (NC)	SSL (C)	SSL (NC)	SSL (C)	SSL (NC)	SSL (C)
Aluminum	*25,900,000*		*43,100,000*		*3,970,000*		*65,300,000*		*68,400,000*		*7,120,000*		*20,800,000*		*62,800,000*	
Antimony[a]	*1,040,000*		*1,720,000*		159,000		*2,610,000*		*2,740,000*		285,000		832,000		*2,510,000*	
Arsenic		2,810		4,670		431		7,080		7,420		773		2,260		6,820
Barium	*2,590,000*		*4,310,000*		397,000		*6,530,000*		*6,840,000*		712,000		*2,080,000*		*6,280,000*	
Beryllium		5,040		8,370		772		12,700		13,300		1,380		4,040		12,200
Cadmium		6,720		11,200		1,030		16,900		17,700		1,850		5,390		16,300
Chromium[b]	518,000	1,010	861,000	1,670	79,400	154	*1,310,000*	2,540	*1,370,000*	2,660	142,000	277	416,000	809	*1,260,000*	2,440
Cobalt	104,000	4,320	172,000	7,180	15,900	662	261,000	10,900	274,000	11,400	28,500	1,190	83,200	3,470	251,000	10,500
Copper																
Iron																
Lead																
Manganese	259,000		431,000		39,700		653,000		684,000		71,200		208,000		628,000	
Mercury	*1,550,000*		*2,580,000*		238,000		*3,920,000*		*4,100,000*		427,000		*1,250,000*		*3,770,000*	
Nickel[c]		50,400		83,700		7,720		127,000		133,000		13,800		40,400		122,000
Selenium																
Silver																
Thallium																
Vanadium																
Zinc																

Notes:

m^3/kg = cubic meters per kilogram

PEF_{RP} = Residue Pile Particulate Emission Factor

SSL (NC) = Soil Screening Level (Non-Carcinogenic)

SSL (C) = Soil Screening Level (Carcinogenic)

All SSLs have units of milligrams per kilogram (mg/kg).

Underlined-italicized RSLs are greater than the maximum value of 1,000,000 mg/kg.

[a]Antimony as antimony trioxide.

[b]Chromium as hexavalent chromium.

[c]Nickel as nickel refinery dust.

TABLE V-7
Commercial/Industrial Worker Scenario: Comparison of Minimum Tier 1 Screening Levels with March 2005 Soil Data
Eagle Zinc Company Site
Hillsboro, Illinois

Analyte	Tier 1 Screening Level (mg/kg) [a]		Concentration in Soil Sample (mg/kg) [b]										
	Ingestion/ Dermal Contact	Particle Inhalation	A1-26-S1	A1-3-S1	A1-3-S1-2	A2-13-S1	A2-3-S1	A2-3-S1D	NA-S1	NA-S2	NA-S2D	NA-S3	NA-S4
Arsenic	1.8	640	***12***	***21***	***5***	***2***	***11***	***7***	***7***	***4***	***5***	***4***	***3***
Iron	34,000		27,000	25,000	19,000	8,100	16,000	12,000	14,000	9,000	10,000	11,000	7,300
Lead [c]	1,235		500	1,100	24	26	30	29	87	120	230	40	31
Vanadium	2,200		39	42	33	23	40	33	32	21	22	28	19

Notes:

mg/kg = milligrams per kilogram

Bold Italics *designates exceedance of screening level.*

[a] Screening levels except for lead are from the Eagle Zinc HHRA (RI Report Table VI-17).

[b] From Table III-4.

[c] From USEPA (2003).

TABLE V-8
Construction Worker Scenario: Comparison of Minimum Tier 1 Screening Levels with March 2005 Soil Data
Eagle Zinc Company Site
Hillsboro, Illinois

Analyte	Tier 1 Screening Level (mg/kg) [a]		Concentration in Soil Sample (mg/kg) [b]										
	Ingestion/ Dermal Contact	Particle Inhalation	A1-26-S1	A1-3-S1	A1-3-S1-2	A2-13-S1	A2-3-S1	A2-3-S1D	NA-S1	NA-S2	NA-S2D	NA-S3	NA-S4
Arsenic	110	16,000	12	21	5	2	11	7	7	4	5	4	3
Iron	89,000		27,000	25,000	19,000	8,100	16,000	12,000	14,000	9,000	10,000	11,000	7,300
Lead [c]	1,235		500	1,100	24	26	30	29	87	120	230	40	31
Vanadium	970		39	42	33	23	40	33	32	21	22	28	19

Notes:

mg/kg = milligrams per kilogram

[a] Screening levels except for lead are from the Eagle Zinc HHRA (RI Report Table VI-18).

[b] From Table III-4.

[c] From USEPA (2003).

TABLE V-9
Trespasser Scenario: Comparison of Minimum Tier 1 Screening Levels with March 2005 Soil Data
Eagle Zinc Company Site
Hillsboro, Illinois

Analyte	Tier 1 Screening Level (mg/kg) [a]		Concentration in Soil Sample (mg/kg) [b]										
	Ingestion/ Dermal Contact	Particle Inhalation	A1-26-S1	A1-3-S1	A1-3-S1-2	A2-13-S1	A2-3-S1	A2-3-S1D	NA-S1	NA-S2	NA-S2D	NA-S3	NA-S4
Arsenic	240	50,000	12	21	5	2	11	7	7	4	5	4	3
Iron	1,000,000		27,000	25,000	19,000	8,100	16,000	12,000	14,000	9,000	10,000	11,000	7,300
Lead [c]	1,235		500	1,100	24	26	30	29	87	120	230	40	31
Vanadium	10,000		39	42	33	23	40	33	32	21	22	28	19

Notes:

mg/kg = milligrams per kilogram

[a] Screening levels except for lead are from the Eagle Zinc HHRA (RI Report Table VI-19).

[b] From Table III-4.

[c] From USEPA (2003).

TABLE V-10
Comparison of Residue Pile Screening Levels[a] with Residue Pile Metals Concentrations [b]
Eagle Zinc Company Site
Hillsboro, Illinois

Analyte (mg/kg)	CPH-6		CPH-9		NP-15		NP-16		RCO-10		RRO-12		RR1-3		RR2-11	
	Conc	RSL	Conc	RSL	Conc	RSL	Conc	RSL	Conc	RSL	Conc	RSL	Conc	RSL	Conc	RSL
Aluminum	7,000	68,400,000	3,800	65,300,000	9,600	20,800,000	6,000	62,800,000	20,000	43,100,000	7,700	7,120,000	4,500	3,970,000	35,000	25,900,000
Antimony	16	2,740,000	16	2,610,000	110	832,000	3.8	2,510,000	190	1,720,000	41	285,000	16	159,000	400	1,040,000
Arsenic	33	7,420	8.1	7,080	11	2,260	12	6,820	41	4,670	11	773	16	431	21	2,810
Barium	210	6,840,000	150	6,530,000	110	2,080,000	130	6,280,000	350	4,310,000	170	712,000	480	397,000	130	2,590,000
Beryllium	1.3	13,300	0.68	12,700	0.97	4,040	0.86	12,200	2.4	8,370	1.6	1,380	0.86	772	1.5	5,040
Cadmium	10	17,700	6.1	16,900	19	5,390	15	16,300	24	11,200	6.9	1,850	35	1,030	7.2	6,720
Chromium	10	2,660	4.4	2,540	62	809	22	2,440	220	1,670	47	277	12	154	290	1,010
Cobalt	250	11,400	440	10,900	500	3,470	430	10,500	760	7,180	440	1,190	9.7	662	93	4,320
Manganese	910	684,000	330	653,000	510	208,000	1,100	628,000	880	431,000	930	71,200	160	39,700	750	259,000
Mercury	0.43	4,100,000	0.046	3,920,000	0.1	1,250,000	0.23	3,770,000	0.024	2,580,000	0.09	427,000	0.075	238,000	0.012	1,550,000
Nickel	650	133,000	610	127,000	1,300	40,400	800	122,000	7,000	83,700	1,000	13,800	22	7,720	10,000	50,400

Notes:
mg/kg = milligrams per kilogram
RSL = Residue Pile Screening Level
[a] From Table V-4.
[b] From Table III-3.

Table VI-1
Summary of SLERA Water/Dietary and Food Web Ecotoxicity Screening Values
Eagle Zinc Company Site
Hillsboro, Illinois

Analyte	Most Sensitive Piscivore[a] NOAEL-Based Benchmark (mg/L)	Deer Mouse[a] NOAEL (mg/kg BW-day)	Avian[a] NOAEL (mg/kg BW-day)
Metals			
Aluminum	0.025	---	---
Antimony	0.22	---	---
Arsenic	0.022	0.15	2.46
Barium	---	---	---
Beryllium	0.188	---	---
Cadmium	0.0004367	2.12	1.45
Calcium	---	---	---
Chromium	4.947	6,020	1
Cobalt	---	---	---
Copper	0.294	33.4	47
Iron	---	---	---
Lead	0.142	17.6	3.85
Magnesium	---	---	---
Manganese	---	---	---
Mercury	0.000001305	2.86	0.45
Nickel	2.104	87.9	77.4
Potassium	---	---	---
Selenium	0.0004318	0.44	0.5
Silver	---	48.8	17
Sodium	---	---	---
Sulfate	---	---	---
Thallium	NA	---	---
Vanadium	---	---	---
Zinc	0.085	352	14.5
Organic Compounds			
cis-1,2-Dichloroethene	---	---	---
Trichloroethylene	---	---	---

Notes:

---	Not available.
mg/kg BW-day	Milligrams per kilogram bodyweight per day.
mg/L	Milligrams per liter.
NOAEL	No Observed Apparent Effects Level.
SLERA	Screening level ecological risk assessment.

[a] Detailed description of the water/dietary food web ecotoxicity screening values is provided in Appendix D.

TABLE VI-2
On-Site SLERA Food Web Risk Calculations for the Deer Mouse and Identification of COPCs
Eagle Zinc Company Site
Hillsboro, Illinois

Constituent (a)	Maximum On Site Concentration (b) In Soil (mg/kg)	In Water (mg/L)	90th Percentile Uptake Factors (c) Vegetation (mg COPC/kg dw tissue)/(mg COPC/kg dw soil)	Invertebrate	Estimated Dietary Tissue Concentrations (d) Vegetation (mg/kg)	Invertebrate	COPC Intake (d) From Soil (mg/kg bw-d)	From Water	From Vegetation	From Invertebrates	Maximum Estimated Dietary Ingestion (d) (mg/kg bw-d)	NOAEL Reference Toxicity Value (e)	NOAEL HQ (f) (Unitless)	Food Web COPC? (g) (yes/no)	Rationale (h)
Metals															
Arsenic	0.0092	ND	1.103	0.523	0.01	0.0048	0.0000417	NA	0.00211	0.00129	0.0034	0.15	0.02	no	HQ ≤ 1
Cadmium	0.0097	0.23	3.25	40.69	0.032	0.39	0.000044	0.0859	0.00676	0.105	0.2	2.12	0.09	no	HQ ≤ 1
Chromium	0.026	ND	---	3.162	NA	0.082	0.000118	NA	NA	0.022	0.022	6,020	0.000004	no	HQ ≤ 1
Copper	3	0.0026	0.625	1.531	1.9	4.6	0.0136	0.000971	0.401	1.24	1.7	33.4	0.05	no	HQ ≤ 1
Lead	0.93	0.0032	0.468	1.522	0.44	1.4	0.00422	0.00119	0.0929	0.376	0.47	17.6	0.03	no	HQ ≤ 1
Mercury	0.000042	ND	5	20.625	0.00021	0.00087	0.00000019	NA	0.0000444	0.000234	0.00028	2.86	0.0001	no	HQ ≤ 1
Nickel	0.88	0.036	1.411	4.73	1.2	4.2	0.00399	0.0134	0.253	1.13	1.4	87.9	0.02	no	HQ ≤ 1
Selenium	0.0012	ND	3.012	1.34	0.0036	0.0016	0.00000544	NA	0.00076	0.00043	0.0012	0.44	0.003	no	HQ ≤ 1
Silver	0.0058	ND	1	1	0.0058	0.0058	0.0000263	NA	0.00122	0.00156	0.0028	48.8	0.00006	no	HQ ≤ 1
Zinc	29	26	1.82	12.885	53	370	0.131	9.71	11.2	99.5	120	352	0.3	no	HQ ≤ 1

Notes:

[box]	HQ > 1	dw	Dry weight.
---	Not available.	mg/L	Milligrams per liter.
COPC	Constituent of Potential Concern.	mg/kg	Milligrams per kilogram.
NOAEL	No observed adverse effects level.	mg/kg bw-d	Milligrams per kilogram of body weight per day.
HQ	Hazard quotient.	NA	Not applicable.
		ND	Not detected.

(a) Only those constituents identified as bioaccumulative COPCs in USEPA 2000, "Bioaccumulation Testing And Interpretation For The Purpose Of Sediment Quality Assessment" are included.
(b) The occurrence of constituents is summarized on Table C-2a (of the RI) and Table ?-? (of the RI Addendum) for surface water and soil, respectively.
(c) Refer to Table D-4 (of the RI) for uptake factors and references.
(d) Formulae for estimated tissue concentrations and dietary ingestion scenarios are presented in Table D-2a (of the RI).
(e) Refer to Table D-1b (of the RI) for reference toxicity values.
(f) The HQ is the ratio of the maximum estimated dietary ingestion of a constituent to the appropriate reference toxicity value. HQs are rounded to 1 significant digit.
(g) A constituent is considered a COPC if it generates a HQ > 1 or if there is no reference toxicity value for that constituent.
(h) This explains why a constituent is (or is not) considered a COPC.

TABLE VI-3
On-Site SLERA Food Web Risk Calculations for the American Robin and Identification of COPCs
Eagle Zinc Company Site
Hillsboro, Illinois

Constituent (a)	Maximum On Site Concentration (b) In Soil (mg/kg)	In Water (mg/L)	90th Percentile Uptake Factors (c) Vegetation (mg COPC/kg dw tissue)/(mg COPC/kg dw soil)	Invertebrate	Estimated Dietary Tissue Concentrations (d) Vegetation (mg/kg)	Invertebrate	COPC Intake (d) From Soil (mg/kg bw-d)	From Water	From Vegetation	From Invertebrates	Maximum Estimated Dietary Ingestion (d) (mg/kg bw-d)	NOAEL Reference Toxicity Value (e)	NOAEL HQ (f) Unitless	Food Web COPC? (g) (yes/no)	Rationale (h)
Metals															
Arsenic	0.0092	ND	1.103	0.523	0.01	0.0048	0.000227	NA	0.000182	0.00116	0.0016	2.46	0.0007	no	HQ ≤ 1
Cadmium	0.0097	0.23	3.25	40.69	0.032	0.39	0.000239	0.0388	0.000582	0.0942	0.13	1.45	0.09	no	HQ ≤ 1
Chromium	0.026	ND	---	3.162	NA	0.082	0.000642	NA	NA	0.0198	0.02	1	0.02	no	HQ ≤ 1
Copper	3	0.0026	0.625	1.531	1.9	4.6	0.074	0.000439	0.0345	1.11	1.2	47	0.03	no	HQ ≤ 1
Lead	0.93	0.0032	0.468	1.522	0.44	1.4	0.0229	0.00054	0.008	0.338	0.37	3.85	0.1	no	HQ ≤ 1
Mercury	0.000042	ND	5	20.625	0.00021	0.00087	0.00000104	NA	0.00000382	0.00021	0.00021	0.45	0.0005	no	HQ ≤ 1
Nickel	0.88	0.036	1.411	4.73	1.2	4.2	0.0217	0.00608	0.0218	1.01	1.1	77.4	0.01	no	HQ ≤ 1
Selenium	0.0012	ND	3.012	1.34	0.0036	0.0016	0.0000296	NA	0.0000655	0.000386	0.00048	0.5	0.001	no	HQ ≤ 1
Silver	0.0058	ND	1	1	0.0058	0.0058	0.000143	NA	0.000105	0.0014	0.0016	17	0.00009	no	HQ ≤ 1
Zinc	29	26	1.82	12.885	53	370	0.716	4.39	0.964	89.4	95	14.5	7	YES	HQ > 1

Notes:

☐	HQ > 1	dw	Dry weight.
---	Not available.	mg/L	Milligrams per liter.
1	HQ is between 1.0 and 1.5.	mg/kg	Milligrams per kilogram.
COPC	Constituent of Potential Concern.	mg/kg bw-d	Milligrams per kilogram of body weight per day.
NOAEL	No observed adverse effects level.	NA	Not applicable.
HQ	Hazard quotient.	ND	Not detected.

(a) Only those constituents identified as bioaccumulative COPCs in USEPA 2000, "Bioaccumulation Testing And Interpretation For The Purpose Of Sediment Quality Assessment" are included.
(b) The occurrence of constituents is summarized on Table C-2a (of the RI) and Table ?-? (of the RI Addendum) for surface water and soil, respectively.
(c) Refer to Table D-4 (of the RI) for uptake factors and references.
(d) Formulae for estimated tissue concentrations and dietary ingestion scenarios are presented in Table D-2b (of the RI).
(e) Refer to Table D-1c (of the RI) for reference toxicity values.
(f) The HQ is the ratio of the maximum estimated dietary ingestion of a constituent to the appropriate reference toxicity value. HQs are rounded to 1 significant digit.
(g) A constituent is considered a COPC if it generates a HQ > 1 or if there is no reference toxicity value for that constituent.
(h) This explains why a constituent is (or is not) considered a COPC.

TABLE VI-4
On-Site SLERA Food Web Risk Calculations for the Red-Tailed Hawk and Identification of COPCs
Eagle Zinc Company Site
Hillsboro, Illinois

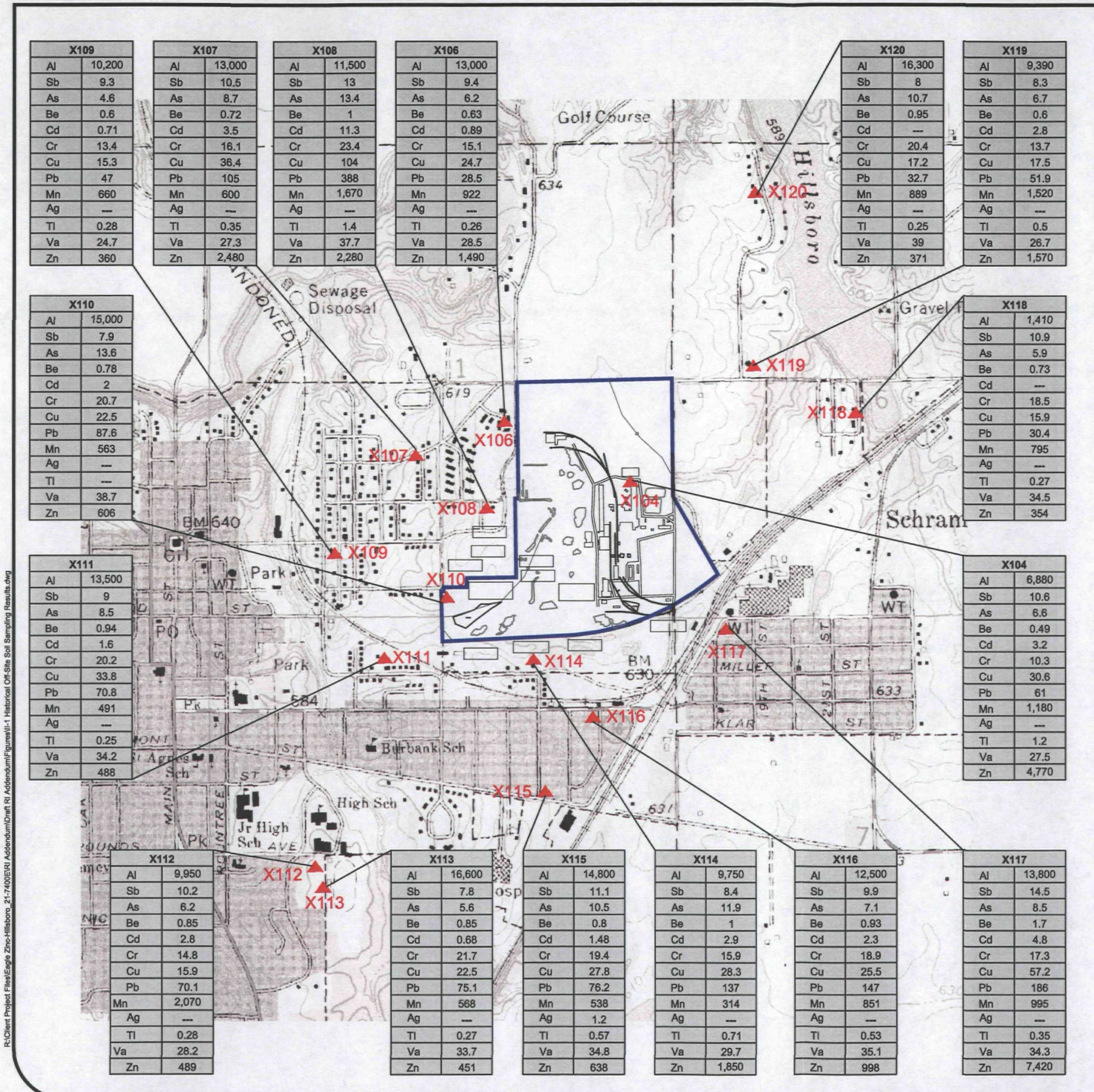
Constituent (a)	Maximum On Site Concentration (b) In Soil (mg/kg)	In Water (mg/L)	90th Percentile Uptake Factors for the Most Sensitive Mammal (c) (mg COPC/kg dw tissue)/ (mg COPC/kg dw soil)	Estimated Dietary Tissue Concentrations (d) Most Sensitive Mammal (mg/kg)	COPC Intake (d) From Water (mg/kg bw-d)	From Mammals	Maximum Estimated Dietary Ingestion (d) (mg/kg bw-d)	NOAEL Reference Toxicity Value (e)	NOAEL HQ (f) (unitless)	Food Web COPC? (g) (yes/no)	Rationale (h)
Metals											
Arsenic	0.0092	ND	0.016	0.00015	NA	0.0000114	0.000011	2.46	0.000004	no	HQ ≤ 1
Cadmium	0.0097	0.23	7.017	0.068	0.0185	0.00519	0.024	1.45	0.02	no	HQ ≤ 1
Chromium	0.026	ND	0.349	0.0091	NA	0.000694	0.00069	1	0.0007	no	HQ ≤ 1
Copper	3	0.0026	1.29	3.9	0.000209	0.297	0.3	47	0.006	no	HQ ≤ 1
Lead	0.93	0.0032	0.339	0.32	0.000257	0.0244	0.025	3.85	0.006	no	HQ ≤ 1
Mercury	0.000042	ND	1.046	0.000044	NA	0.00000336	0.0000034	0.45	0.000008	no	HQ ≤ 1
Nickel	0.88	0.036	0.898	0.79	0.0029	0.0603	0.063	77.4	0.0008	no	HQ ≤ 1
Selenium	0.0012	ND	1.263	0.0015	NA	0.000114	0.00011	0.5	0.0002	no	HQ ≤ 1
Silver	0.0058	ND	1	0.0058	NA	0.000442	0.00044	17	0.00003	no	HQ ≤ 1
Zinc	29	26	2.90106	84	2.09	6.41	8.5	14.5	0.6	no	HQ ≤ 1

Notes:

$\boxed{}$	HQ > 1		
1	HQ is between 1.0 and 1.5.	mg/L	Milligrams per liter.
COPC	Constituent of Potential Concern.	mg/kg	Milligrams per kilogram.
NOAEL	No observed adverse effects level.	mg/kg bw-d	Milligrams per kilogram of body weight per day.
HQ	Hazard quotient.	NA	Not available or not applicable.
dw	Dry weight.	ND	Not detected.

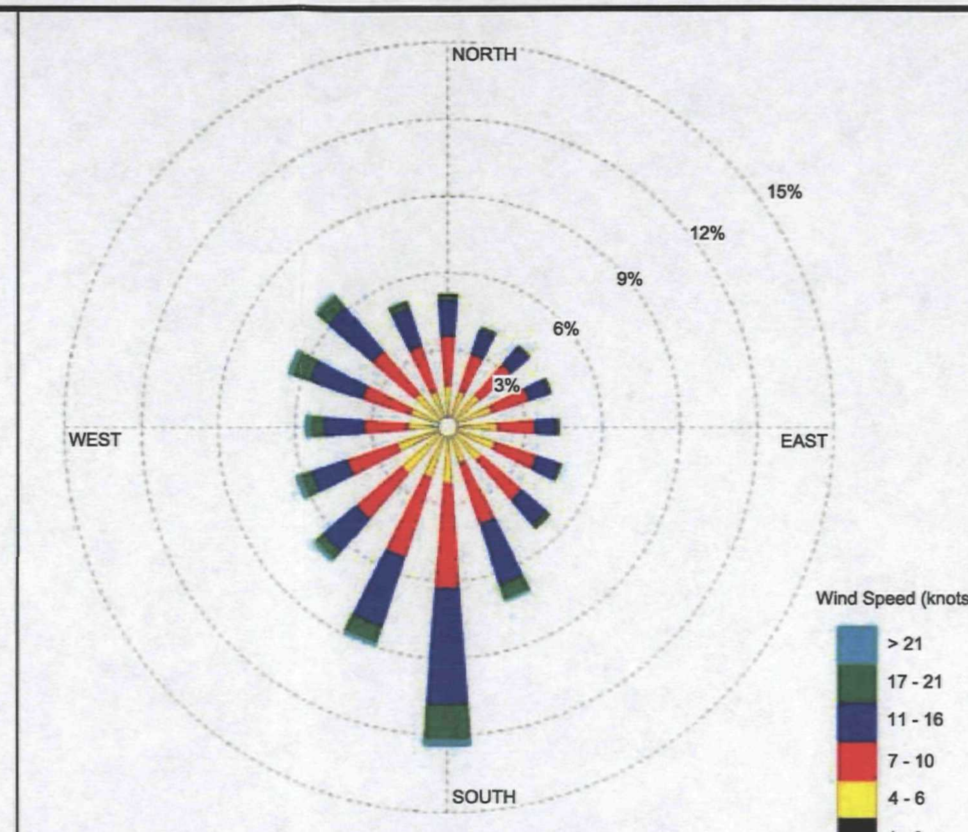
(a) Only those constituents identified as bioaccumulative COPCs in USEPA 2000, "Bioaccumulation Testing And Interpretation For The Purpose Of Sediment Quality Assessment" are included.
(b) The occurrence of constituents is summarized on Table C-2a (of the RI) and Table ?-? (of the RI Addendum) for surface water and soil, respectively.
(c) Refer to Table D-4 (of the RI) for uptake factors and references.
(d) Formulae for estimated tissue concentrations and dietary ingestion scenarios are presented in Table D-2c (of the RI).
(e) Refer to Table D-1c (of the RI) for reference toxicity values.
(f) The HQ is the ratio of the maximum estimated dietary ingestion of a constituent to the appropriate reference toxicity value. HQs are rounded to 1 significant digit.
(g) A constituent is considered a COPC if it generates a HQ > 1 or if there is no reference toxicity value for that constituent.
(h) This explains why a constituent is (or is not) considered a COPC.

FIGURES



Constituent	X109	X107	X108	X106	X120	X119	X110	X118	X111	X104
Al	10,200	13,000	11,500	13,000	16,300	9,390	15,000	1,410	13,500	6,880
Sb	9.3	10.5	13	9.4	8	8.3	7.9	10.9	9	10.6
As	4.6	8.7	13.4	6.2	10.7	6.7	13.6	5.9	8.5	6.6
Be	0.6	0.72	1	0.63	0.95	0.6	0.78	0.73	0.94	0.49
Cd	0.71	3.5	11.3	0.89	---	2.8	2	---	1.6	3.2
Cr	13.4	16.1	23.4	15.1	20.4	13.7	20.7	18.5	20.2	10.3
Cu	15.3	36.4	104	24.7	17.2	17.5	22.5	15.9	33.8	30.6
Pb	47	105	388	28.5	32.7	51.9	87.6	30.4	70.8	61
Mn	660	600	1,670	922	889	1,520	563	795	491	1,180
Ag	---	---	---	---	---	---	---	---	---	---
Tl	0.28	0.35	1.4	0.26	0.25	0.5	---	0.27	0.25	1.2
Va	24.7	27.3	37.7	28.5	39	26.7	38.7	34.5	34.2	27.5
Zn	360	2,480	2,280	1,490	371	1,570	606	354	488	4,770

Constituent	X101-B/G	X102-B/G	X112	X113	X115	X114	X116	X117
Al	12,400	10,000	9,950	16,600	14,800	9,750	12,500	13,800
Sb	8.9	9.2	10.2	7.8	11.1	8.4	9.9	14.5
As	5.8	5.7	6.2	5.6	10.5	11.9	7.1	8.5
Be	0.8	0.81	0.85	0.85	0.8	1	0.93	1.7
Cd	---	---	2.8	0.68	1.48	2.9	2.3	4.8
Cr	16.2	14.4	14.8	21.7	19.4	15.9	18.9	17.3
Cu	20	19.7	15.9	22.5	27.8	28.3	25.5	57.2
Pb	148	236	70.1	75.1	76.2	137	147	186
Mn	434	686	2,070	568	538	314	851	995
Ag	---	---	---	---	1.2	---	---	---
Tl	0.33	0.34	0.28	0.27	0.57	0.71	0.53	0.35
Va	28.5	27.1	28.2	33.7	34.8	29.7	35.1	34.3
Zn	136	138	489	451	638	1,850	998	7,420



WIND ROSE DIAGRAM
SPRINGFIELD, IL AIRPORT
1961-1990 ANNUAL AVERAGE

▲ 1993 IEPA Surface Soil Sample

SAMPLE ID	
Constituent	Concentration mg/kg

Al = Aluminum
Sb = Antimony
As = Arsenic
Be = Beryllium
Cd = Cadmium
Cr = Chromium
Cu = Copper
Pb = Lead
Mn = Manganese
Ag = Silver
Tl = Thallium
Va = Vanadium
Zn = Zinc

USEPA REGION 3 RBCs	
Al	78,000
Sb	31
As	0.43
Be	160
Cd	78
Cr	230
Cu	3,100
Pb	400
Mn	1,600
Ag	390
Tl	5.5
Va	78
Zn	23,000

NOTES:

1. Concentrations in milligrams per kilograms.
2. Except for X104 and X110, all samples collected in 1993 by IEPA from ground surface at residential properties.

0 1200
SCALE IN FEET

ENVIRON

HISTORICAL OFF-SITE SOIL SAMPLING RESULTS
EAGLE ZINC COMPANY SITE
HILLSBORO, ILLINOIS

DATE: 04/08/05	CONTRACT NUMBER: 21-7400E	FIGURE: II-1
DRAFTER: APR	APPROVED:	REVISED:

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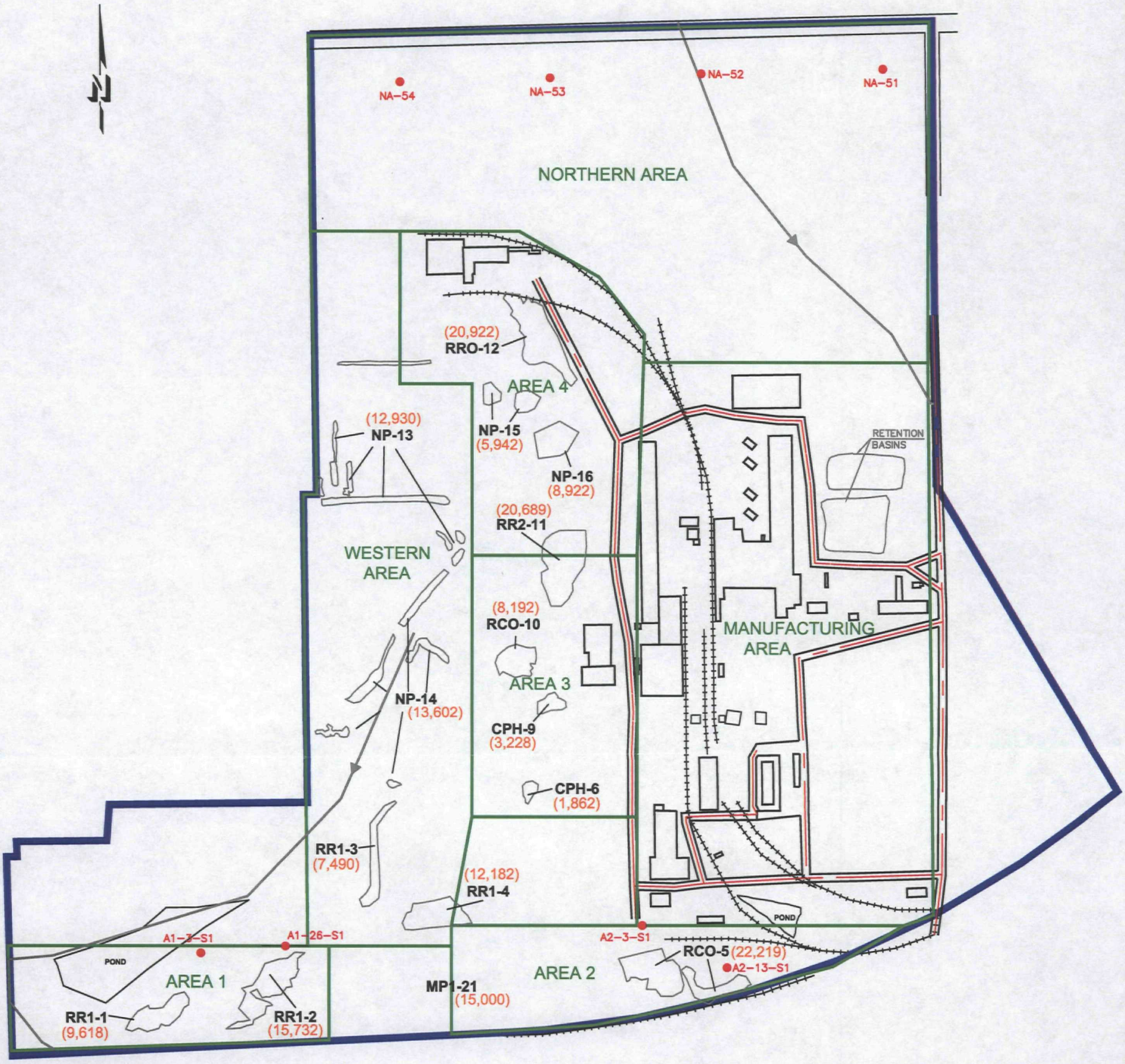

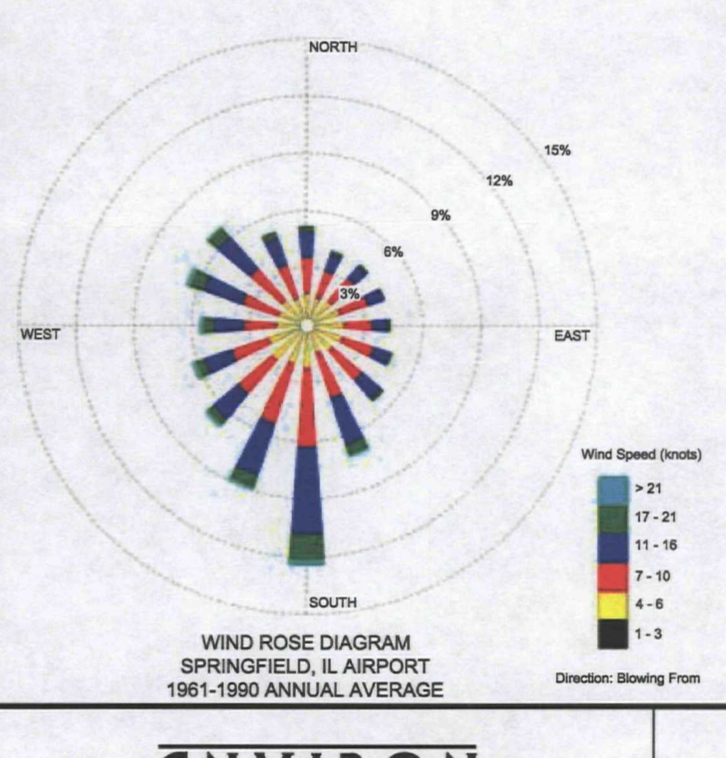

WIND ROSE DIAGRAM
SPRINGFIELD, IL AIRPORT
1961-1990 ANNUAL AVERAGE

LEGEND

- SURFACE SOIL SAMPLE LOCATION - TAL METALS ANALYSIS
- RESIDUE PILES - TAL METALS AND PARTICLE SIZE ANALYSIS
- (1,862) SURFACE AREA (FT^2)
- STORMWATER DRAINAGEWAY

RR1 = ROTARY RESIDUE TYPE 1
RR2 = ROTARY RESIDUE TYPE 2
RCO = ROTARY CLEAN OUT
RRO = ROTARY RESIDUE OVERSIZE
CPH = CARBON PLANT HUTCH
MP = MISCELLANEOUS PILES
NP = NEWLY IDENTIFIED PILES

APPROX. SCALE (ft.)
0 320

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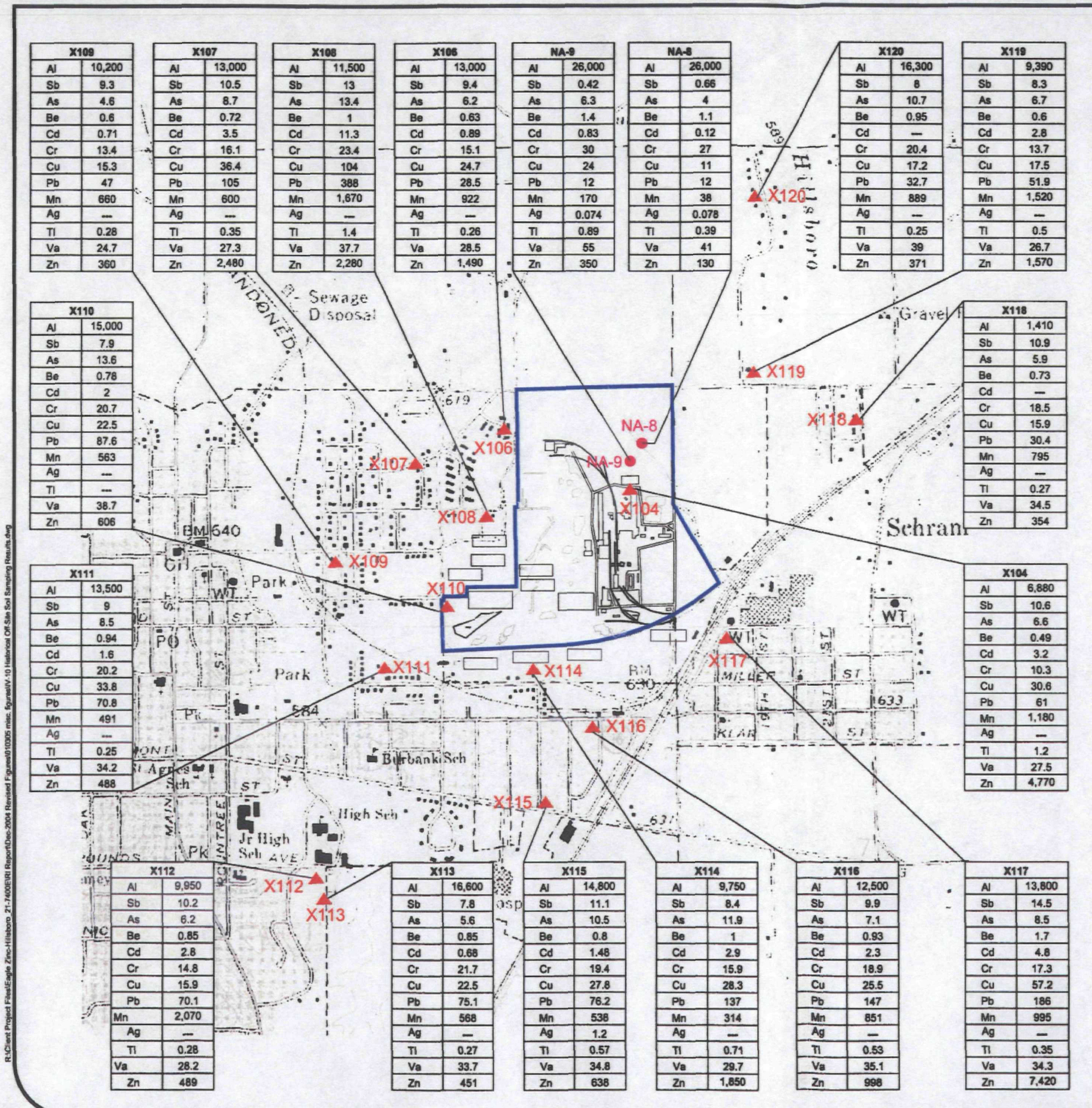
ENVIRON	SAMPLE LOCATIONS - RI ADDENDUM EAGLE ZINC COMPANY SITE HILLSBORO, ILLINOIS	FIGURE III-1

DRAFTER: APR DATE: 04/08/05 CONTRACT NUMBER: 21-7400E APPROVED: REVISED:



X109	
Al	10,200
Sb	9.3
As	4.6
Be	0.6
Cd	0.71
Cr	13.4
Cu	15.3
Pb	47
Mn	660
Ag	—
Tl	0.28
Va	24.7
Zn	360

X107	
Al	13,000
Sb	10.5
As	8.7
Be	0.72
Cd	3.5
Cr	16.1
Cu	36.4
Pb	105
Mn	600
Ag	—
Tl	0.35
Va	27.3
Zn	2,480

X108	
Al	11,500
Sb	13
As	13.4
Be	1
Cd	11.3
Cr	23.4
Cu	104
Pb	388
Mn	1,670
Ag	—
Tl	1.4
Va	37.7
Zn	2,280

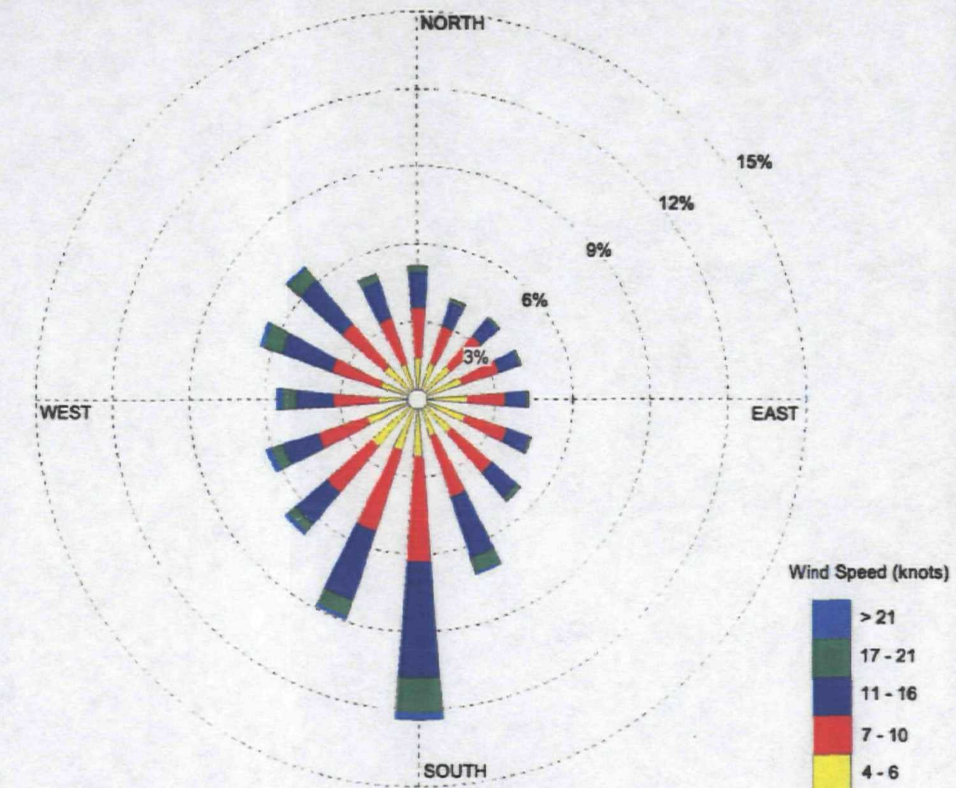
X106	
Al	13,000
Sb	9.4
As	6.2
Be	0.63
Cd	0.89
Cr	15.1
Cu	24.7
Pb	28.5
Mn	922
Ag	—
Tl	0.26
Va	28.5
Zn	1,490

NA-9	
Al	26,000
Sb	0.42
As	6.3
Be	1.4
Cd	0.83
Cr	30
Cu	24
Pb	12
Mn	170
Ag	0.074
Tl	0.89
Va	55
Zn	350

NA-8	
Al	26,000
Sb	0.66
As	4
Be	1.1
Cd	0.12
Cr	27
Cu	11
Pb	12
Mn	38
Ag	0.078
Tl	0.39
Va	41
Zn	130

X120	
Al	16,300
Sb	8
As	10.7
Be	0.95
Cd	—
Cr	20.4
Cu	17.2
Pb	32.7
Mn	889
Ag	—
Tl	0.25
Va	39
Zn	371

X119	
Al	9,390
Sb	8.3
As	6.7
Be	0.6
Cd	2.8
Cr	13.7
Cu	17.5
Pb	51.9
Mn	1,520
Ag	—
Tl	0.5
Va	26.7
Zn	1,570



WIND ROSE DIAGRAM
SPRINGFIELD, IL AIRPORT
1961-1990 ANNUAL AVERAGE

X110	
Al	15,000
Sb	7.9
As	13.6
Be	0.78
Cd	2
Cr	20.7
Cu	22.5
Pb	87.6
Mn	563
Ag	—
Tl	—
Va	38.7
Zn	606

X118	
Al	1,410
Sb	10.9
As	5.9
Be	0.73
Cd	—
Cr	18.5
Cu	15.9
Pb	30.4
Mn	795
Ag	—
Tl	0.27
Va	34.5
Zn	354

X111	
Al	13,500
Sb	9
As	8.5
Be	0.94
Cd	1.6
Cr	20.2
Cu	33.8
Pb	70.8
Mn	491
Ag	—
Tl	0.25
Va	34.2
Zn	488

X104	
Al	6,880
Sb	10.6
As	6.6
Be	0.49
Cd	3.2
Cr	10.3
Cu	30.6
Pb	61
Mn	1,180
Ag	—
Tl	1.2
Va	27.5
Zn	4,770

X101-B/G	
Al	12,400
Sb	8.9
As	5.8
Be	0.8
Cd	—
Cr	16.2
Cu	20
Pb	148
Mn	434
Ag	—
Tl	0.33
Va	28.5
Zn	136

X102-B/G	
Al	10,000
Sb	9.2
As	5.7
Be	0.81
Cd	—
Cr	14.4
Cu	19.7
Pb	236
Mn	686
Ag	—
Tl	0.34
Va	27.1
Zn	138

SAMPLE ID	
Constituent	Concentration mg/kg

Al = Aluminum
Sb = Antimony
As = Arsenic
Be = Beryllium
Cd = Cadmium
Cr = Chromium
Cu = Copper
Pb = Lead
Mn = Manganese
Ag = Silver
Tl = Thallium
Va = Vanadium
Zn = Zinc

USEPA REGION 3 RBCs	
Al	78,000
Sb	31
As	11.2
Be	160
Cd	78
Cr	230
Cu	3,100
Pb	400
Mn	1,600
Ag	390
Tl	6.3
Va	23
Zn	23,000

X112	
Al	9,950
Sb	10.2
As	6.2
Be	0.85
Cd	2.8
Cr	14.8
Cu	15.9
Pb	70.1
Mn	2,070
Ag	—
Tl	0.28
Va	28.2
Zn	489

X113	
Al	16,600
Sb	7.8
As	5.6
Be	0.85
Cd	0.68
Cr	21.7
Cu	22.5
Pb	75.1
Mn	568
Ag	—
Tl	0.27
Va	33.7
Zn	451

X115	
Al	14,800
Sb	11.1
As	10.5
Be	0.8
Cd	1.48
Cr	19.4
Cu	27.8
Pb	76.2
Mn	538
Ag	1.2
Tl	0.57
Va	34.8
Zn	638

X114	
Al	9,750
Sb	8.4
As	11.9
Be	1
Cd	2.9
Cr	15.9
Cu	28.3
Pb	137
Mn	314
Ag	—
Tl	0.71
Va	29.7
Zn	1,850

X116	
Al	12,500
Sb	9.9
As	7.1
Be	0.93
Cd	2.3
Cr	18.9
Cu	25.5
Pb	147
Mn	851
Ag	—
Tl	0.53
Va	35.1
Zn	998

X117	
Al	13,800
Sb	14.5
As	8.5
Be	1.7
Cd	4.8
Cr	17.3
Cu	57.2
Pb	186
Mn	995
Ag	—
Tl	0.35
Va	34.3
Zn	7,420

▲ 1993 IEPA Soil Sample

● RI/FS Soil Sample collected in Northern Area in July 2002

NOTES:

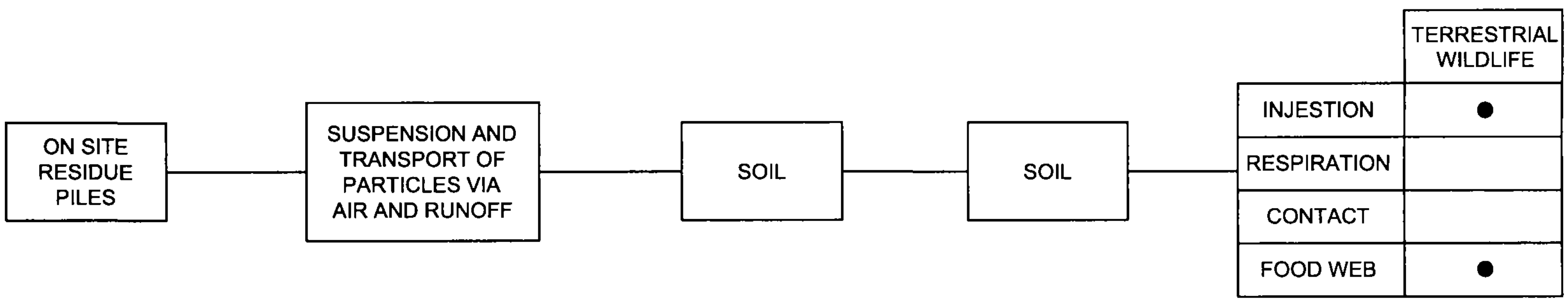
1. Concentrations in milligrams per kilograms.
2. Except for X104 and X110, all samples collected in 1993 by IEPA from ground surface at residential properties.

0 1200
SCALE IN FEET

ENVIRON

HISTORICAL OFF-SITE SOIL SAMPLING RESULTS
EAGLE ZINC
HILLSBORO, ILLINOIS

DATE: 01/04/05	CONTRACT NUMBER: 21-7400E	FIGURE
DRAFTER: APR	APPROVED: REVISED:	IV-10



ENVIRON

CONCEPTUAL SITE MODEL FOR RESIDUE PILES, ECOLOGICAL PATHWAYS
EAGLE ZINC COMPANY SITE
HILLSBORO, ILLINOIS

Figure
VI-1

Drafter: APR | Date: 04/08/05 | Contract Number: 21-7400E | Approved: | Revised:

R:\Client Project Files\Eagle Zinc-Hillsboro_21-7400E\RI Addendum\Draft RI Addendum\Figures\VI-1 Conceptual Site Model.dwg

APPENDIX A

Photographic Log – Residue Piles

Appendix A
Eagle Zinc – Residue Piles Photo Log

Photograph 1: Pile RRO-12, looking west.

Photograph 2: Pile RRO-12, view downward at top of pile.

Appendix A
Eagle Zinc – Residue Piles Photo Log

Photograph 3: Pile NP15, view from top of pile looking north.

Photograph 4: Pile NP-15, looking west.

Photograph 5: Pile NP-15, looking west.

Photograph 6: Pile NP-16, looking west.

Photograph 7: Pile NP-16, side view of pile looking south.

Photograph 8: Pile NP-16, view downward at top of pile.

Photograph 9: Pile RR2-11, looking west.

Photograph 10: Pile RR2-11, looking downward at the pile.

Photograph 11: Pile RCO-10, looking southwest.

Photograph 12: Pile RCO-10, view downward near the top of the pile.

Photograph 13: Pile CPH-9, looking west.

Photograph 14: Pile CPH-9, looking west from top of pile.

Photograph 15: Pile CPH-9, looking east at top of pile.

Photograph 16: Pile CPH-9, looking north.

Photograph 17: Pile NP-13, looking west.

Photograph 18: Pile NP-13, looking downward at residue material.

Photograph 19: Pile NP-14, looking southwest.

Photograph 20: Pile CPH-6, looking southwest.

Photograph 21: Pile CPH-6, looking southwestward at side of pile.

Photograph 22: Pile RCO-5, looking west.

Photograph 23: Pile RCO-5, close-up of typical materials.

Photograph 24: Pile RCO-5, looking south.

Photograph 25: Pile RR1-4, looking north.

Photograph 26: Pile RR1-4, looking downward at top of pile.

Photograph 27: Pile RR1-3, looking north at west side of pile.

Photograph 28: Pile RR1-3, looking downward at top of the pile.

Photograph 29: Pile RR1-3, looking south along west side of the pile.

Photograph 30: Pile MP1-21, looking east.

Photograph 31: Pile MP1-21, looking north.

Photograph 32: Pile MP1-21, looking downward at the top of the pile.

Photograph 33: Pile RR1-2, looking south.

Photograph 34: Pile RR1-2, looking downward at residue materials.

Photograph 35: Pile RR1-1, looking south.

Photograph 36: Pile RR1-1, looking downward at residue materials.

APPENDIX B

Residue Pile Characterization Forms

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID RR0-12
Date 3/11/2005
Height Average - 15 feet
Surface Area 20,922 sq. ft.

Description: Gray to Brown slag. Particle sizes range from silt/sand size up to 3 in. Larger particles are somewhat rounded. Approximately 20% of exposed particles are > 2 in. Photos 1 and 2.
Crusting Evaluation Notes: No crusting. Fine-grained matrix (sand/silt size) partially exposed at top of pile.
Percent non-erodible elements (>1cm) at surface of the pile: 60-80%

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID NP-15
Date 3/11/2005
Height Pile 1: 4-12 ft; Pile 2: 4-5 ft.
Surface Area 5,942 sq. ft.

Description: Miscellaneous brown to gray to whitish slag in two separate piles, partially consolidated. Particles up to 18 in. Photo 3, 4 and 5.
Crusting Evaluation Notes: Some of the piles consit of hard aggegates of slag fragments. Pile surfaces are 15% crusted overall. Crusting is > 2 ft. thick. Approximately 50% of surface particiles are > 2 in.
Percent non-erodible elements (> 1cm)at surface of the pile: 60-80% (both piles)

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID	NP-16
Date	3/11/2005
Height	4-25 ft.
Surface Area	8,922 sq. ft.

Description: Gray to brown slag, bricks and other debris. Particle sizes range from silt/sand size up to 10 in. Larger particles are somewhat rounded. Photos 6, 7 and 8.
Crusting Evaluation Notes: No crusting.
Percent non-erodible elements (> 1cm) at surface of the pile: 70-90%

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID	RR2-11
Date	3/11/2005
Height	20-30 ft.
Surface Area	20,689 sq. ft.

Description: Gray to brown slag. Particle sizes up to 6 in. (1/2 "-2" common). Contains a sand/silt-size matrix. Photos 9 and 10.
Crusting Evaluation Notes: No crusting, but pile contains some blocks of fused slag. Pile surface is loose overall.
Percent non-erodible elements (> 1cm) at surface of the pile: 40-65%

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID	RCO-10
Date	3/11/2005
Height	4-20 ft.
Surface Area	8,192 sq. ft.

Description: Light to dark gray slag. Typically sand/silt to 1 in. particle size with occassional arger fragments. Photos 11 and 12.
Crusting Evaluation Notes: 1-2%; mainly at top of pile
Percent non-erodible elememts (> 1cm) at surface of the pile: 10-50% (Average - 20%)

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID	CPH-9
Date	3/11/2005
Height	6-18 ft.
Surface Area	3,228 sq. ft.

Description: Main conical pile of fire-grained light gray slag with larger piles extending southwest of main pile. Material is hard and compacted. Pile has a coating of loose material at the surface. Dominant particle size is <1/2" - 1/2". Photos 13 and 14.
Crusting Evaluation Notes: Entire pile is consolidated; some loose material on top.
Percent non-erodible elements (> 1cm)at surface of the pile: 0-10%

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID	NP-13
Date	3/11/2005
Height	1 to 3 ft.
Surface Area	12,930 sq. ft.

Description: Dark gray to black slag, mostly in 1/2 "-3" range. Elongated piles. Some have a coating of vegetative matter (pine needles, etc.) and soil. All piles are borded by tall grass (grass is taller than piles). Photos 17 and 18.
Crusting Evaluation Notes: No crusting.
Percent non-erodible elements (> 1cm) at surface of the pile: 70-100%

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID	NP-14
Date	3/11/2005
Height	0.5-3ft.
Surface Area	13, 602 sq. ft.

Description: Dark gray to black slag, mostly in 1/2 "-3" range. Elongated piles. Some have a coating of vegetative matter (pine needles, etc.) and soil. All piles are borded by tall grass (grass is taller than the piles). Photo 19.
Crusting Evaluation Notes: No crusting.
Percent non-erodible elements (> 1cm) at surface of the pile: 70-100%

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID	CPH-6
Date	3/11/2005
Height	15 ft.
Surface Area	1,862 sq. ft.

Description: Conical light gray slag pile. Contains large slabs of previously crusted material intermixed with relatively fine (1/8" - 1/4") particles (pile disturbed by trackhoe during previous sampling). Photos 20 and 21.
Crusting Evaluation Notes: Consolidated/crusted blocks make up approximately 30% of pile surface area.
Percent non-erodible elements (> 1cm) at surface of the pile: 30% (due to consolidated, crusted blocks).

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID	RC0-5
Date	3/11/2005
Height	2 - 5 ft.
Surface Area	22,219 sq. ft.

Description: Multiple truck-load piles of large, miscellaneous slag, refractory brick and other debris. Colors: brown, gray, black and whitish. Sand-size up to >12 in. Photos 24, 25 and 26.
Crusting Evaluation Notes: Not crusted.
Percent non-erodible elements (> 1cm) at surface of the pile: 30-100% (average - 60%)

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID	RR1-4
Date	3/11/2005
Height	6 ft.
Surface Area	12,182 sq. ft.

Description: Brown to gray slag. Sand size to 2 in. Mostly in range of 1/2" - 1". Loose on top; highly consolidated/hard within interior of pile. Photos 27 and 28.
Crusting Evaluation Notes: 1% piles contains between 0 - 1 ft. loose material over hard crusted material.
Percent non-erodible elements (> 1cm) at surface of the pile: 50%

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID	RR1-3
Date	3/11/2005
Height	5 - 8 ft.
Surface Area	7,490 sq. ft.

Description: Brown to dark gray slag. Interior of pile consists of large masses of fused particles. Loose material on top of pile (sand size - 2 in.) Photos 29, 30 and 31.
Crusting Evaluation Notes: 10% - only on sides of pile.
Percent non-erodible elements (> 1cm) at surface of the pile: 50% - 70% (includes particles >1cm, as well as fused masses exposed on sides of pile)

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID MP1-21
Date 3/11/2005
Height 3 - 6 ft.
Surface Area unknown sq. ft.

Description: Dark gray to brown to orange (oxidized) largely consolidated slag. Mainly consists of fine grained particles (up to 1/8" - 1/4"). Loose material on top of piles. Photos 32, 33 and 34.
Crusting Evaluation Notes: Piles are consolidated, but covered by 1 - 3 " loose material at top.
Percent non-erodible elements (> 1cm) at surface of the pile: 10 - 50%

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID	RR1-2
Date	3/11/2005
Height	2 - 4 ft.
Surface Area	15,732 sq. ft.

Description: Large brown to gray to whitish slag; 3 - 12" particles common. Some intermixed fines. Exists in "truck load" piles. Photos 35 and 36.
Crusting Evaluation Notes: 1%, very localized.
Percent non-erodible elements (> 1cm) at surface of the pile: 70 - 80%

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID	RR1-1
Date	3/11/2005
Height	2 - 4 ft.
Surface Area	9,618 sq. ft.

Description: Large brown to gray to whitish slag; 3 - 12" particles common. Some intermixed fines. Exists in "truck load" piles. Photos 37 and 38.
Crusting Evaluation Notes: None
Percent non-erodible elements (> 1cm) at surface of the pile: 70 - 80%

APPENDIX C

Particle Size Distribution Results - Residues

STS CONSULTANTS

STS Consultants, Ltd.
750 Corporate Woods Parkway
Vernon Hills, Illinois 60061

voice 847-279-2500
fax 847-279-2510
web www.stsconsultants.com

March 23, 2005

Mr. Christopher Greco
Environ International Corporation
123 North Wacker Drive
Chicago, Illinois 60606

RE: Laboratory Testing Program For The Eagles Zinc Project – STS Project No. 34601

Dear Mr. Greco:

We are pleased to submit two (2) copies of our laboratory report that pertains to the testing of fifteen (15) soil samples received in our laboratory March 14, 2005. The samples were in reference to the Eagles Zinc project. As per your request, STS Consultants, Ltd. performed the following tests on each sample:

- Particle Size Analysis -- ASTM D 422
- Moisture Content -- ASTM D 2216

The test data included in this report only represent the samples tested and may not reflect actual site materials and/or conditions. The scope of services provided by STS Consultants, Ltd. did not include interpretation of the laboratory test data, and therefore, we are not liable for any interpretation performed by others. If you wish us to provide you with this service, we would be happy to discuss this matter with you at your convenience. Any reproduction of this report must be done in its entirety.

We are pleased to have the opportunity to provide you with our testing services. Should you have any questions, or require additional assistance, please feel free to contact us at any time.

Respectfully,

STS CONSULTANTS LTD.

William P. Quinn
Laboratory Manager

Charles W. Pfingsten, PE
Principal Engineer

Encl.

STS Consultants Ltd.
Consulting Engineers

Moisture Content Data Sheet
ASTM D 2216

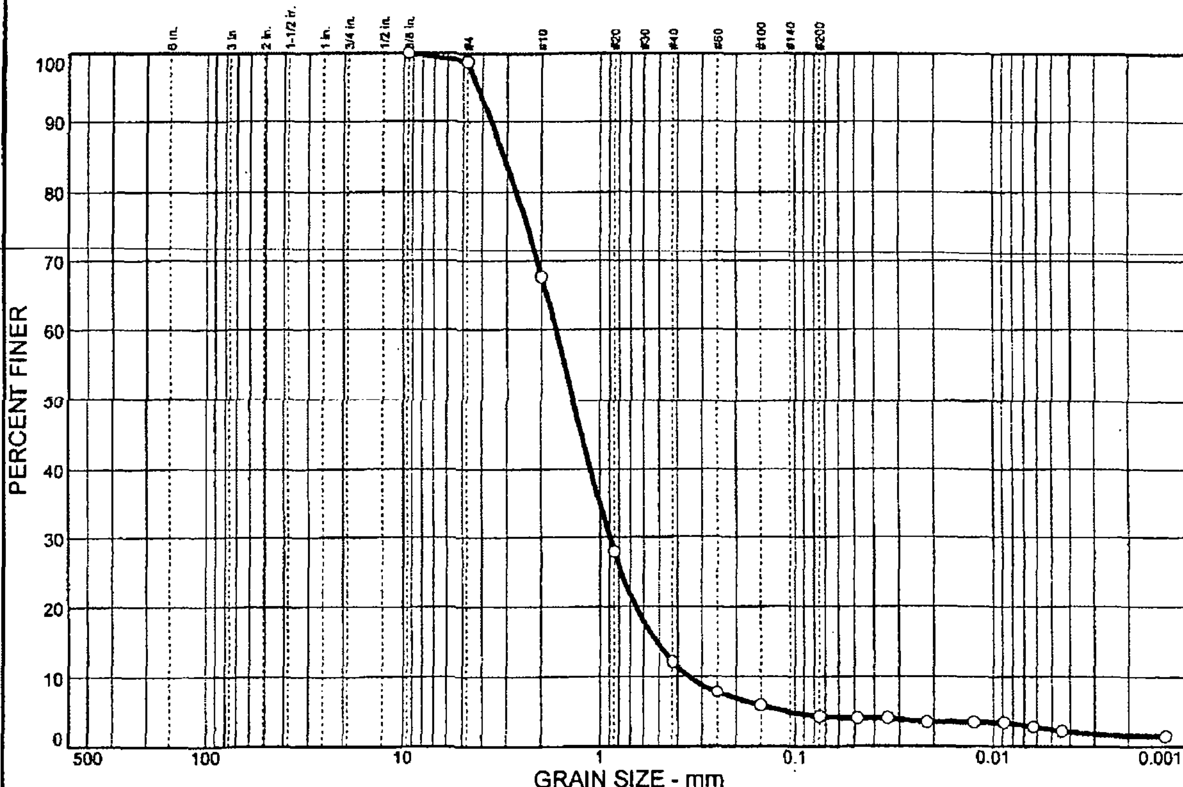
STS Project No.: 34601
Project Name: Eagles Zinc Project
Date: 3/14/2005

Boring Number	Sample No. Number	Depth (ft)	WC (%)
—	CPH-6	—	5.0
—	CPH-9	—	5.0
—	MP1-21	—	11.0
—	NP-13	—	5.2
—	NP-14	—	6.8
—	NP-15	—	4.9
—	NP-16	—	6.4
—	RR0-12	—	8.4
—	RR1-1	—	8.6
—	RR1-2	—	4.9
—	RR1-3	—	7.5
—	RR1-4	—	6.7
—	RR2-11	—	4.4
—	RCO-5	—	8.0
—	RCO-10	—	8.8

Techncian: Ken Proctor

Checked By: W. P. Quinn

Particle Size Distribution Report (ASTM D422)



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.2	31.1	55.6	8.0	1.8	2.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	98.8		
#10	67.7		
#20	28.0		
#40	12.1		
#60	7.7		
#100	5.7		
#200	4.1		

* (no specification provided)

Soil Description

F-C SAND SIZED SLAG TRACE CLAY TRACE SILT TRACE FINE GRAVEL - LT. GRAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.11 D_{60}= 1.70 D_{50}= 1.39
D_{30}= 0.896 D_{15}= 0.517 D_{10}= 0.349
C_u= 4.86 C_c= 1.36

Classification

USCS= SP AASHTO=

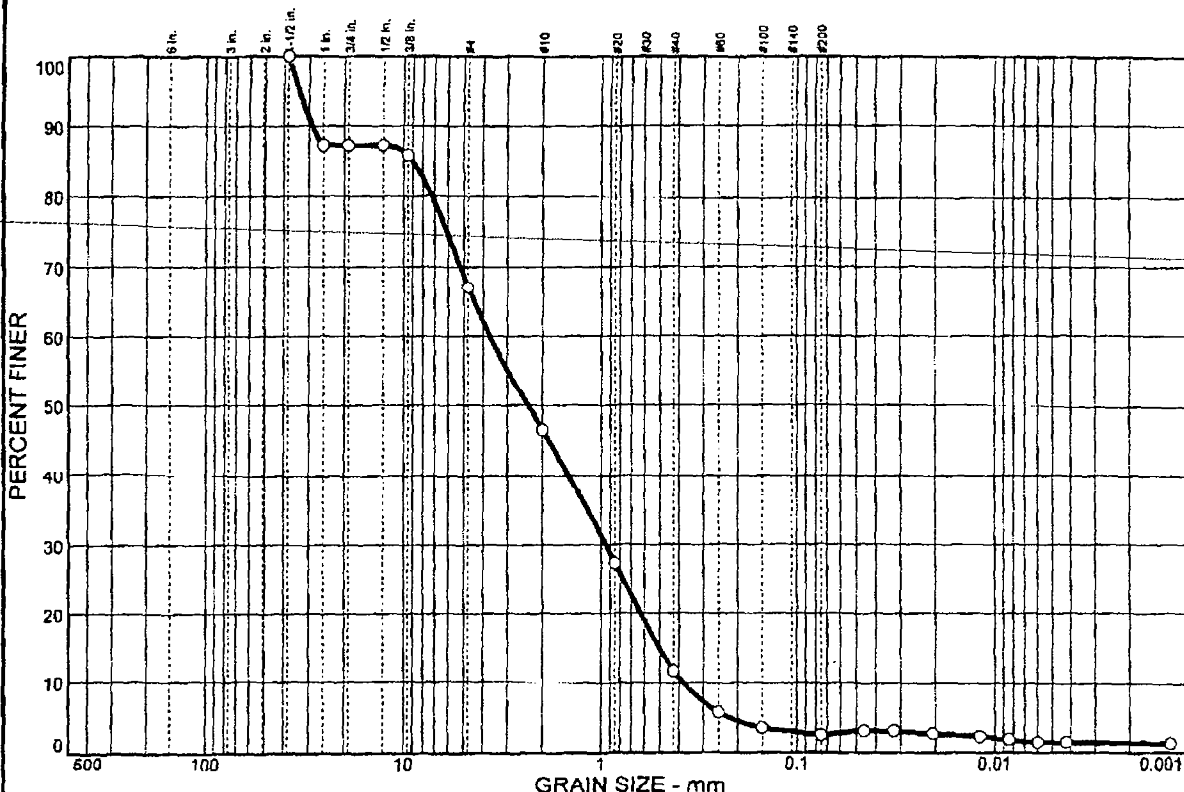
Remarks

Sample No.: CPH-6 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT
Project No: 34601 **Plate**

Particle Size Distribution Report (ASTM D422)



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	12.7	20.3	20.5	34.8	9.3	1.0	1.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1.0 in.	87.3		
.75 in.	87.3		
.50 in.	87.3		
.375 in.	85.9		
#4	67.0		
#10	46.5		
#20	27.4		
#40	11.7		
#60	5.6		
#100	3.4		
#200	2.4		

* (no specification provided)

Soil Description

F-C SAND SIZED SLAG SOME F-C GRAVEL SIZES TRACE CLAY SILT SIZES - GRAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 8.95 D_{60}= 3.69 D_{50}= 2.37
D_{30}= 0.947 D_{15}= 0.504 D_{10}= 0.382
C_u= 9.65 C_c= 0.64

Classification

USCS= SP AASHTO=

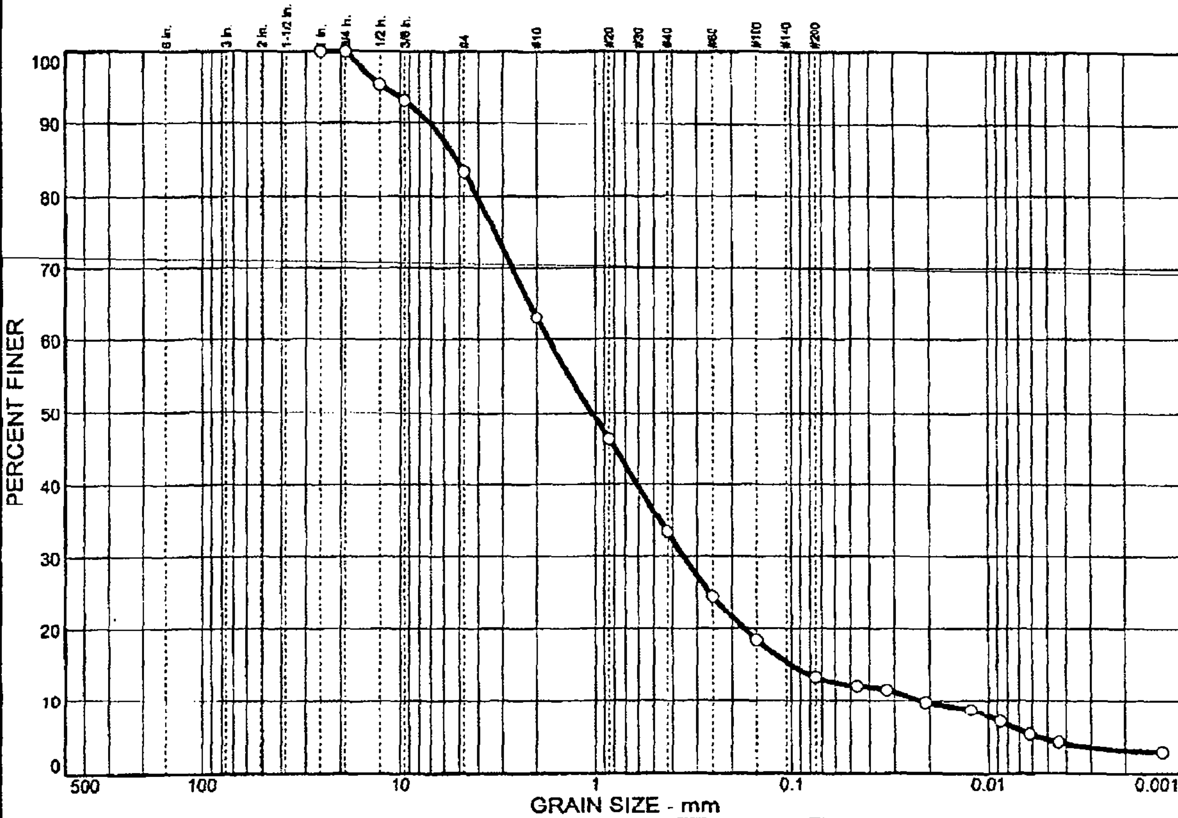
Remarks

Sample No.: CPH-9 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT
Project No: 34601 **Plate**

Particle Size Distribution Report ASTM D422)



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	16.7	70.1	8.6	4.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0 in.	100.0		
.75 in.	100.0		
.50 in.	95.5		
.375 in.	93.3		
#4	83.3		
#10	63.0		
#20	46.2		
#40	33.2		
#60	24.6		
#100	18.4		
#200	13.2		

* (no specification provided)

Soil Description

F-C SAND SIZED SLAG LITTLE FINE GRAVEL SIZES TRACE SILT CLAY SIZES - BROWN

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 5.18 D_{60}= 1.74 D_{50}= 1.04
D_{30}= 0.354 D_{15}= 0.102 D_{10}= 0.0223
C_u= 78.30 C_c= 3.22

Classification

USCS= SM AASHTO=

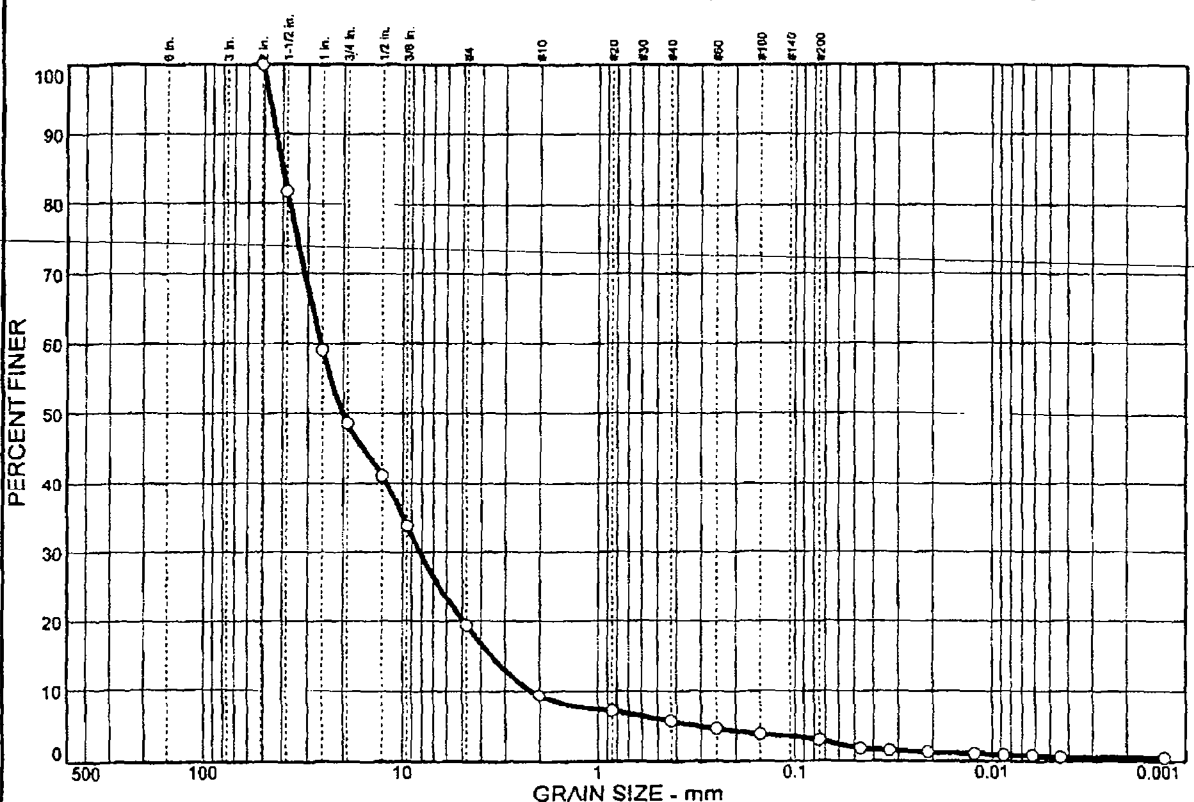
Remarks

Sample No.: MP1-12 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT
Project No: 34601 **Plate**

Particle Size Distribution Report (ASTM D422)



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	51.4	29.2	10.1	3.8	2.6	2.3	0.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2.0 in.	100.0		
1.5 in.	81.9		
1.0 in.	59.1		
.75 in.	48.6		
.50 in.	41.1		
.375 in.	33.7		
#4	19.4		
#10	9.3		
#20	7.0		
#40	5.5		
#60	4.5		
#100	3.7		
#200	2.9		

* (no specification provided)

Soil Description

F-C GRAVEL SIZED SLAG LITTLE F-C SAND SIZES TRACE SILT SIZES - BROWN & GRAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 40.0 D_{60}= 25.9 D_{50}= 20.0
D_{30}= 8.21 D_{15}= 3.53 D_{10}= 2.21
C_u= 11.72 C_c= 1.18

Classification

USCS= GW AASHTO=

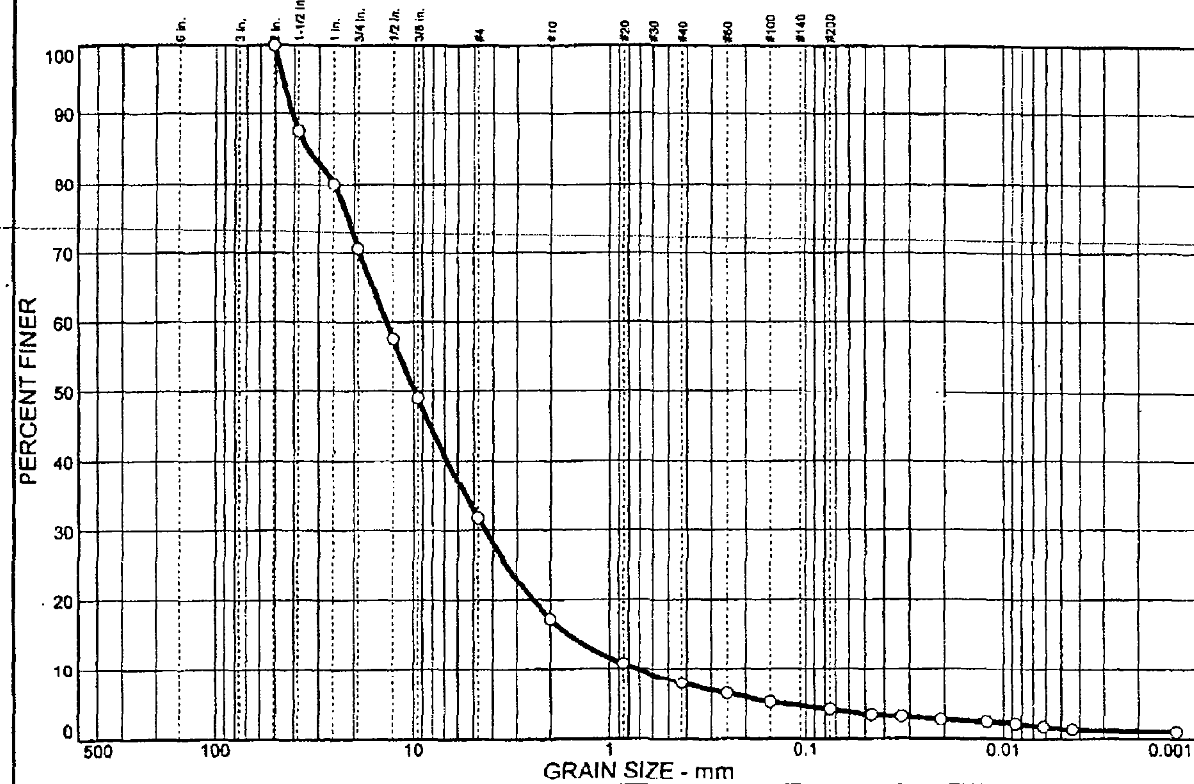
Remarks

Sample No.: NP-13 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT
Project No: 34601 **Plate**

Particle Size Distribution Report (ASTM D422)



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	29.4	38.9	14.5	9.3	3.8	2.7	1.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2.0 in.	100.0		
1.5 in.	87.5		
1.0 in.	80.0		
.75 in.	70.6		
.50 in.	57.6		
.375 in.	49.0		
#4	31.7		
#10	17.2		
#20	10.7		
#40	7.9		
#60	6.4		
#100	5.2		
#200	4.1		

* (no specification provided)

Soil Description

F-C GRAVEL SIZED SLAG SOME F-C SAND SIZES TRACE SILT CLAY SIZES - BROWN & GRAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 34.3 D_{60}= 13.7 D_{50}= 9.86
D_{30}= 4.38 D_{15}= 1.62 D_{10}= 0.733
C_u= 18.74 C_c= 1.90

Classification

USCS= GW AASHTO=

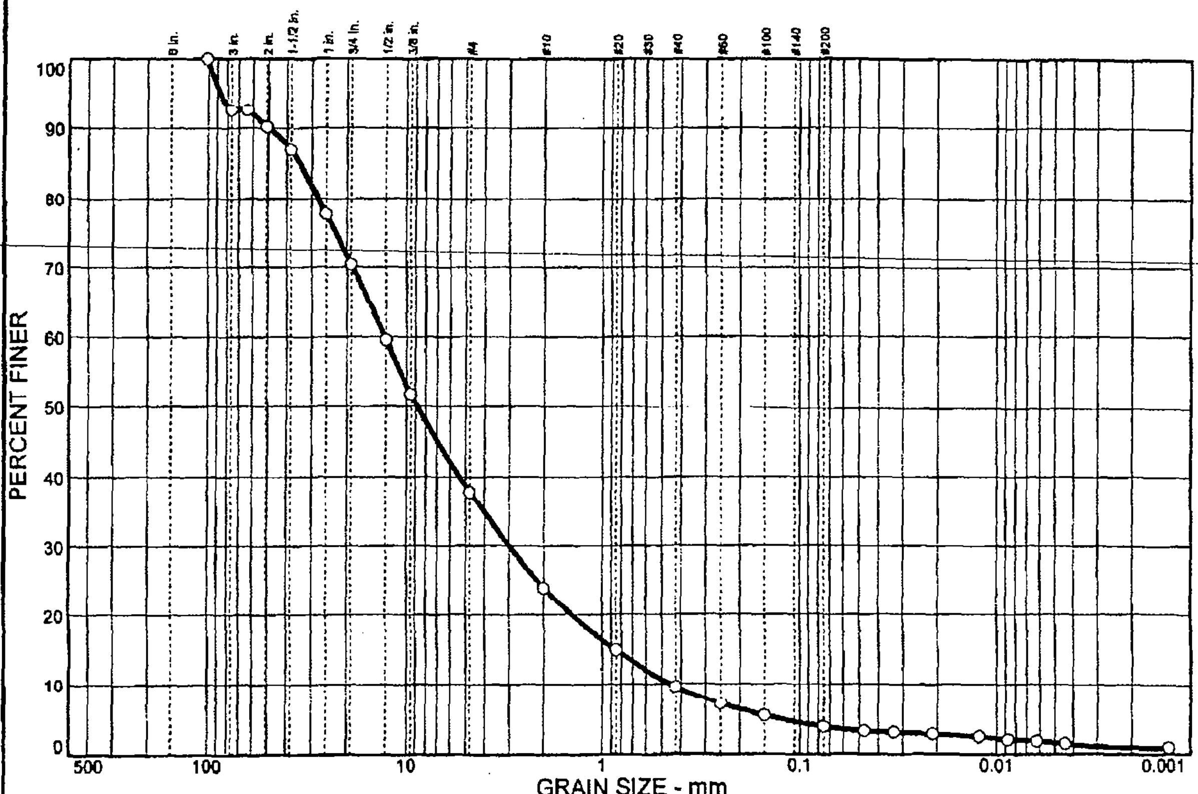
Remarks

Sample No.: NP-14 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT
Project No: 34601 **Plate**

Particle Size Distribution Report (ASTM D422)



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
7.4	22.2	32.6	13.8	14.4	5.8	2.2	1.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4 in.	100.0		
3 in.	92.6		
2.5 in.	92.6		
2 in.	90.2		
1.5 in.	86.8		
1.0 in.	77.6		
.75 in.	70.4		
.50 in.	59.5		
.375 in.	51.9		
#4	37.8		
#10	24.0		
#20	14.9		
#40	9.6		
#60	7.1		
#100	5.4		
#200	3.8		

* (no specification provided)

Soil Description

F-C GRAVEL SIZED SLAG SOME F-C SAND TRACE COBBLES TRACE SILT TRACE CLAY - GRAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 34.6 D_{60}= 12.9 D_{50}= 8.80
D_{30}= 3.00 D_{15}= 0.860 D_{10}= 0.453
C_u= 28.52 C_c= 1.54

Classification

USCS= GW AASHTO=

Remarks

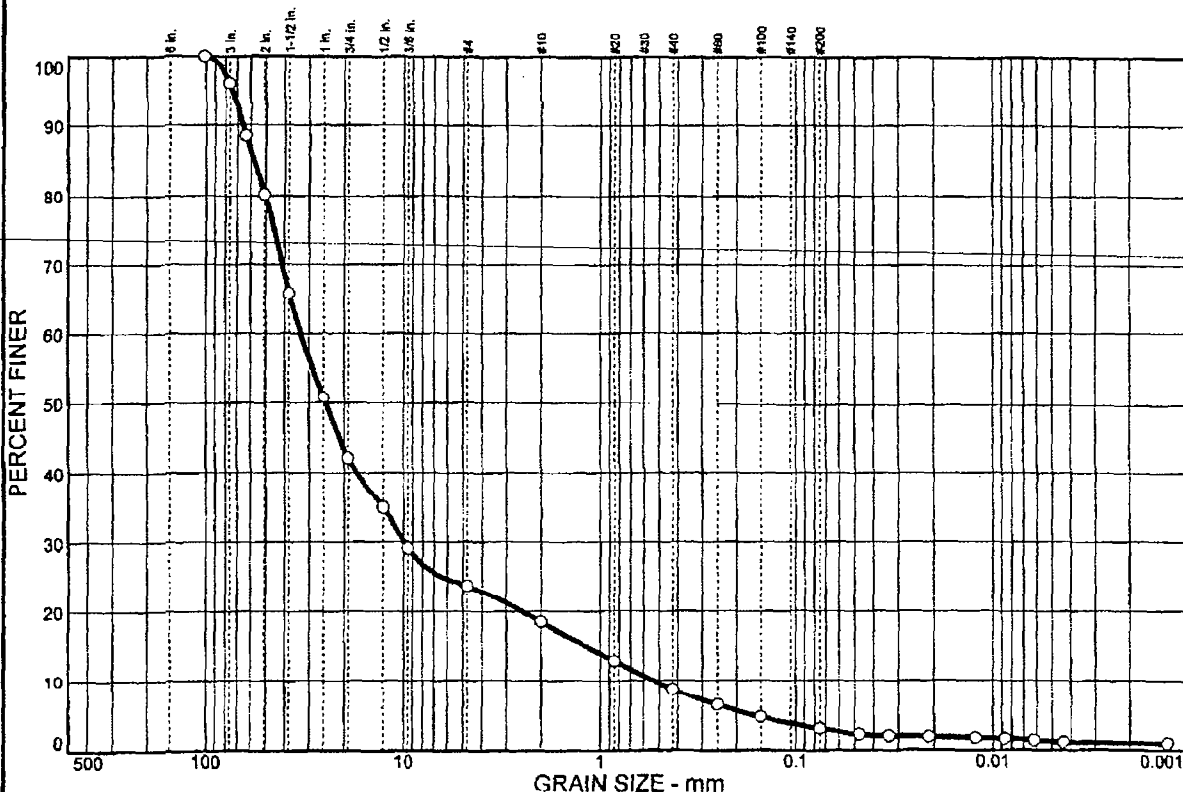
Sample No.: NP-15 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT

Project No: 34601 **Plate**

Particle Size Distribution Report (ASTM D422)



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
3.8	54.1	18.3	5.3	9.8	5.7	1.8	1.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4 in.	100.0		
3 in.	96.2		
2.5 in.	88.5		
2.0 in.	80.2		
1.5 in.	65.8		
1.0 in.	50.9		
.75 in.	42.1		
.50 in.	34.8		
.375 in.	29.2		
#4	23.8		
#10	18.5		
#20	12.8		
#40	8.7		
#60	6.4		
#100	4.7		
#200	3.0		

* (no specification provided)

Soil Description

F-C GRAVEL SIZED SLAG SOME F-C SAND TRACE COBBLE TRACE SILT TRACE CLAY - GRAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 57.8 D_{60}= 33.2 D_{50}= 24.7
D_{30}= 9.96 D_{15}= 1.19 D_{10}= 0.540
C_u= 61.58 C_c= 5.53

Classification

USCS= GP AASHTO=

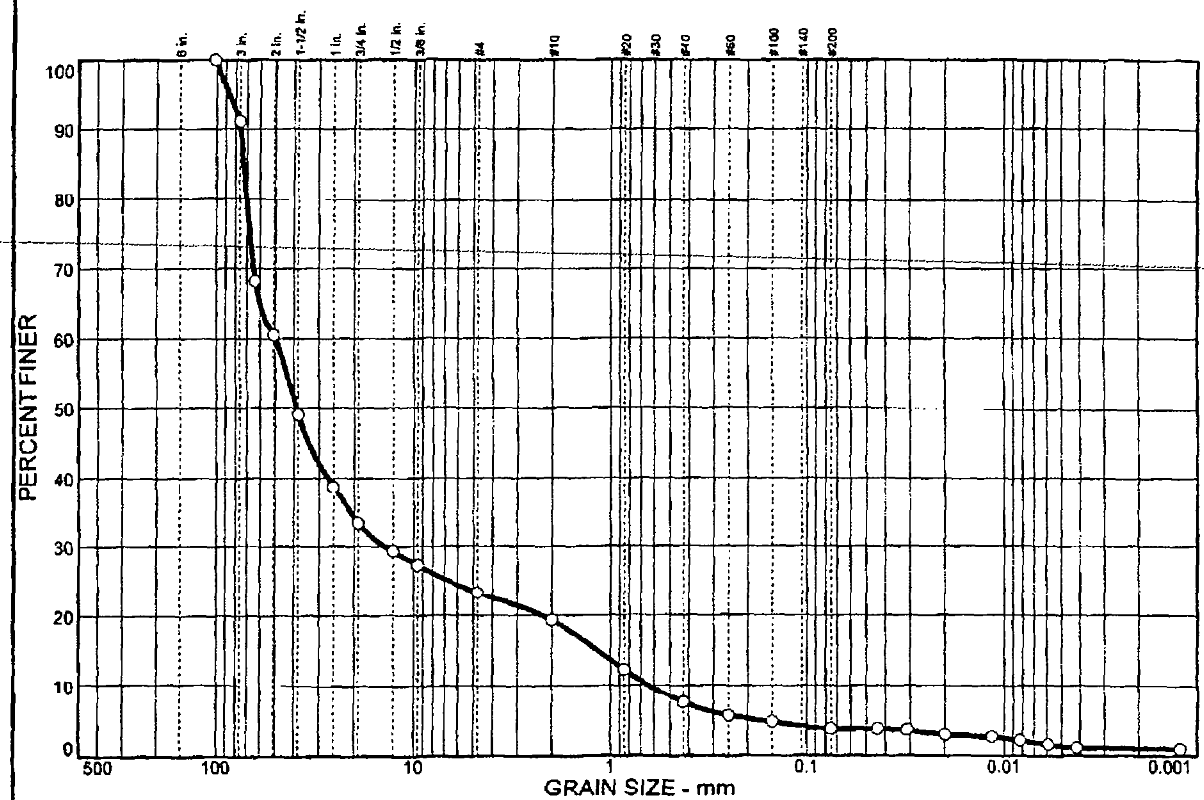
Remarks

Sample No.: NP-16 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT
Project No: 34601 **Plate**

Particle Size Distribution Report (ASTM D422)



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
8.9	57.8	10.0	4.0	11.8	3.8	2.4	1.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4 in.	100.0		
3 in.	91.1		
2.5 in.	68.2		
2 in.	60.5		
1.5 in.	49.1		
1.0 in.	38.7		
.75 in.	33.3		
.50 in.	29.3		
.375 in.	27.3		
#4	23.3		
#10	19.3		
#20	12.2		
#40	7.5		
#60	5.6		
#100	4.7		
#200	3.7		

* (no specification provided)

Soil Description

F-C GRAVEL SIZED SLAG LITTLE F-C SAND TRACE COBBLES TRACE SILT TRACE CLAY - GRAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 73.1 D_{60}= 49.8 D_{50}= 38.9
D_{30}= 14.0 D_{15}= 1.17 D_{10}= 0.640
C_u= 77.79 C_c= 6.13

Classification

USCS= GP AASHTO=

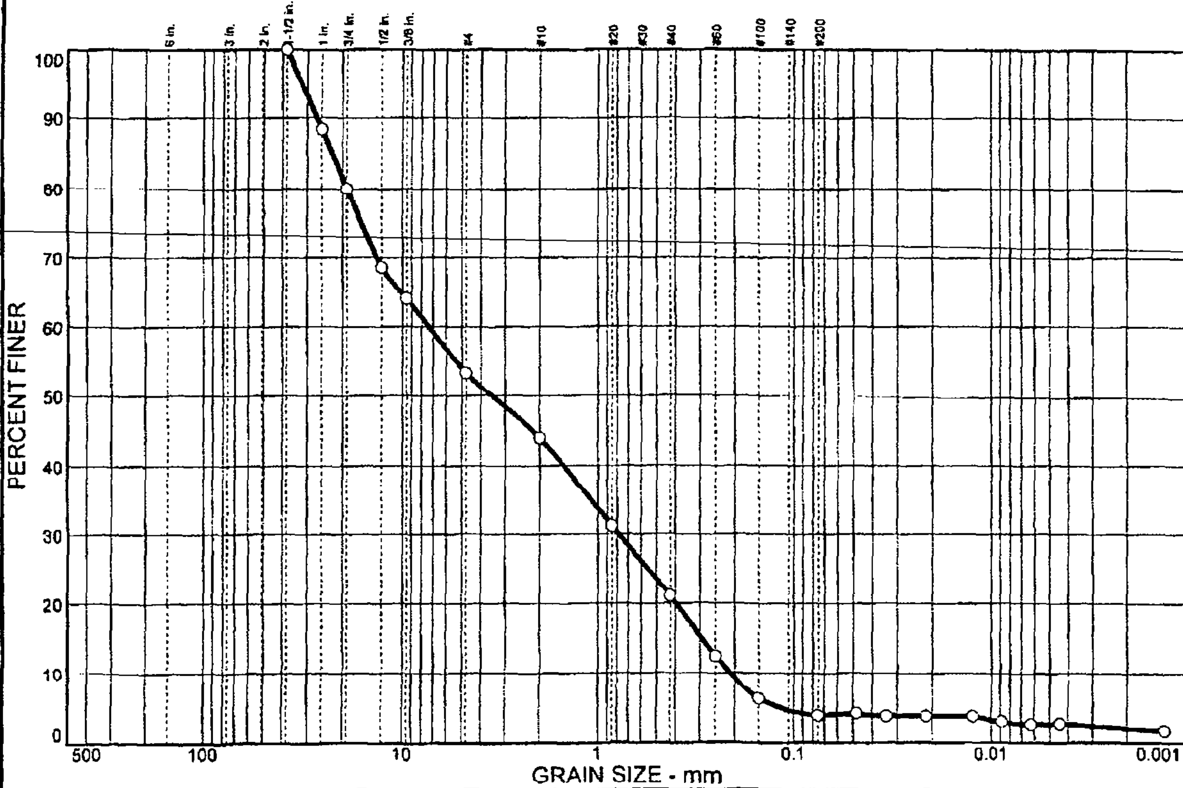
Remarks

Sample No.: RCO-5 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT
Project No: 34601 **Plate**

Particle Size Distribution Report (ASTM D422)



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	20.0	26.5	9.5	22.9	17.3	1.2	2.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1.0 in.	88.4		
.75 in.	80.0		
.50 in.	68.6		
.375 in.	63.9		
#4	53.5		
#10	44.0		
#20	31.1		
#40	21.1		
#60	12.4		
#100	6.2		
#200	3.8		

* (no specification provided)

Soil Description

F-C SAND SIZED SLAG AND F-C GRAVEL SIZES TRACE SILT CLAY SIZES - GRAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 22.6 D_{60}= 7.37 D_{50}= 3.50
D_{30}= 0.789 D_{15}= 0.294 D_{10}= 0.212
C_u= 34.82 C_c= 0.40

Classification

USCS= SP AASHTO=

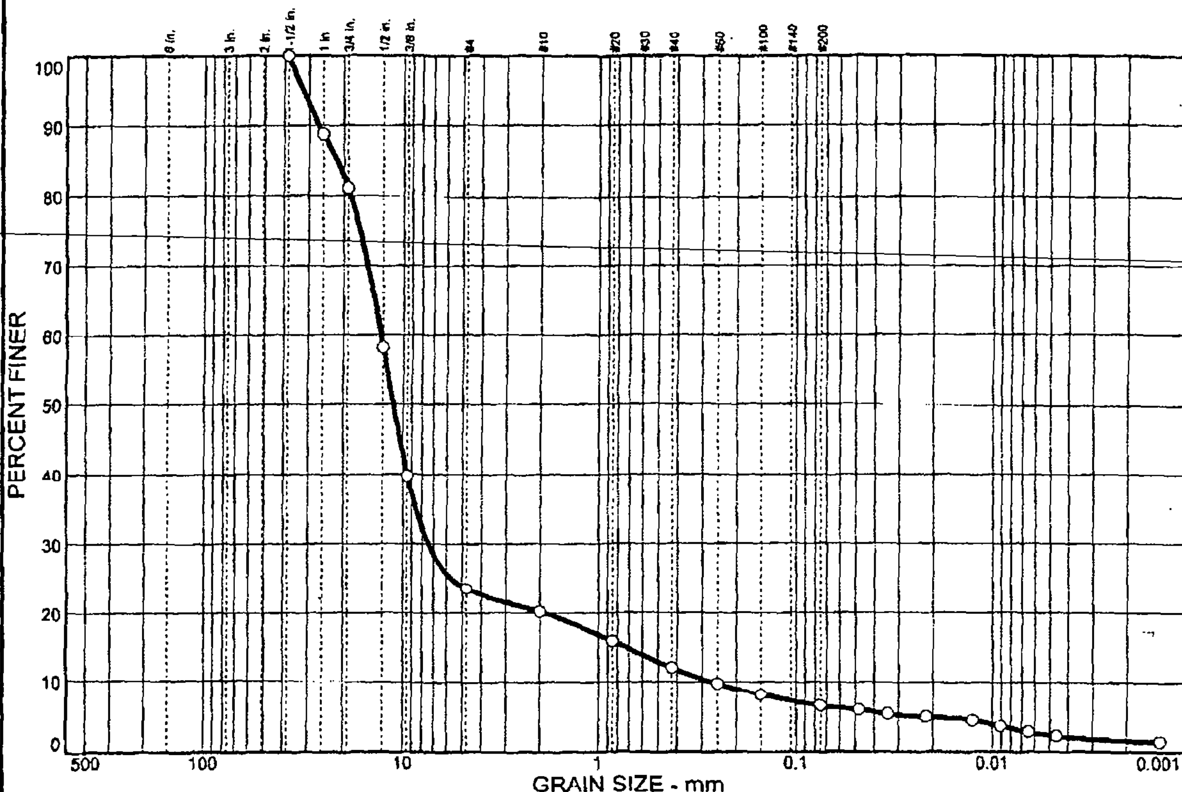
Remarks

Sample No.: RCO-10 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT
Project No: 34601 **Plate**

Particle Size Distribution Report (ASTM D422)



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	18.7	57.7	3.4	8.2	5.5	4.2	2.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1.0 in.	88.8		
.75 in.	81.3		
.50 in.	58.3		
.375 in.	39.8		
#4	23.6		
#10	20.2		
#20	15.9		
#40	12.0		
#60	9.7		
#100	8.1		
#200	6.5		

* (no specification provided)

Soil Description

F-C GRAVEL SIZED SLAG LITTLE F-C SAND SIZES TRACE SILT CLAY SIZES - DK. GRAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 21.5 D_{60}= 13.0 D_{50}= 11.2
D_{30}= 7.44 D_{15}= 0.729 D_{10}= 0.271
C_u= 48.06 C_c= 15.69

Classification

USCS= GP-GM AASHTO=

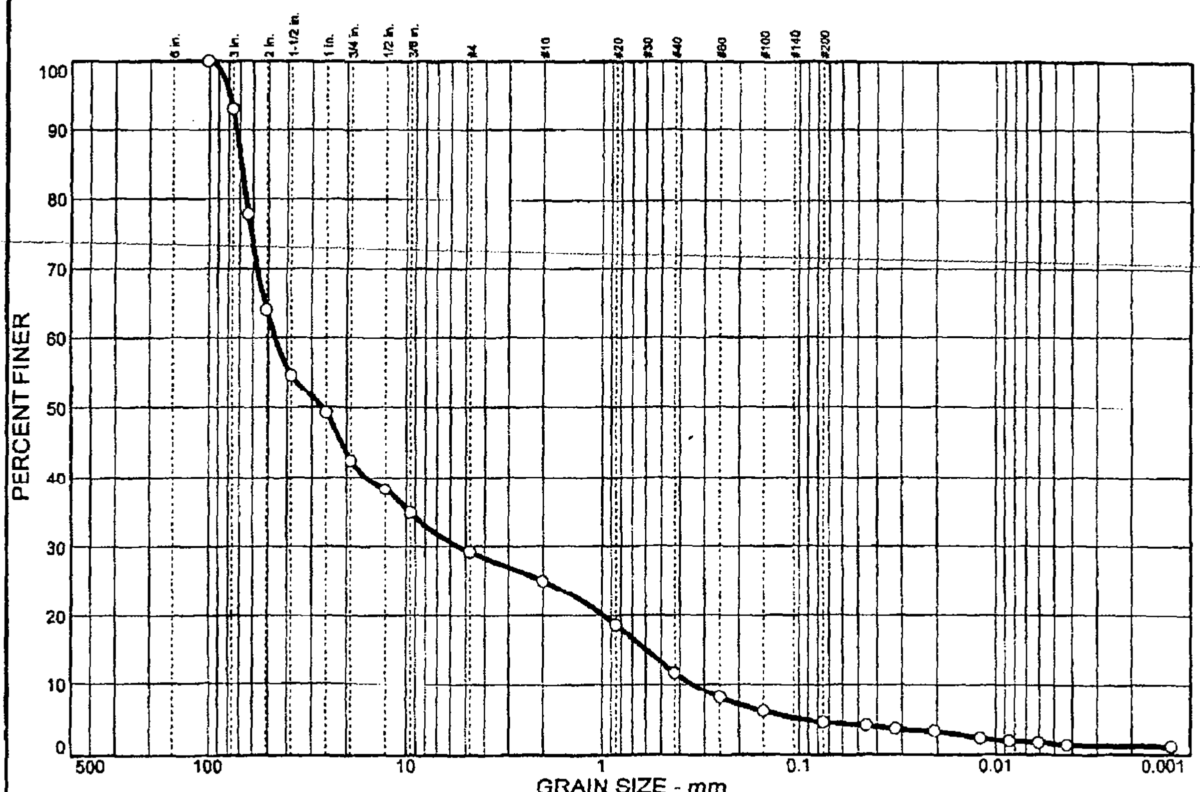
Remarks

Sample No.: RR0-12 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT
Project No: 34601 **Plate**

Particle Size Distribution Report (ASTM D422)



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
7.0	50.6	13.2	4.1	13.4	7.2	3.0	1.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4.0 in.	100.0		
3.0 in.	93.0		
2.5 in.	77.8		
2 in.	63.8		
1.5 in.	54.7		
1 in.	49.2		
.75 in.	42.4		
.50 in.	38.2		
.375 in.	34.8		
#4	29.2		
#10	25.1		
#20	18.6		
#40	11.7		
#60	8.0		
#100	6.1		
#200	4.5		

* (no specification provided)

Soil Description

F-C GRAVEL SIZED SLAG SOME F-C SAND SIZES TRACE COBBLES TRACE SILT TRACE CLAY - GRAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 68.9 D_{60}= 46.3 D_{50}= 26.6
D_{30}= 5.47 D_{15}= 0.596 D_{10}= 0.345
C_u= 134.34 C_c= 1.87

Classification

USCS= GW AASHTO=

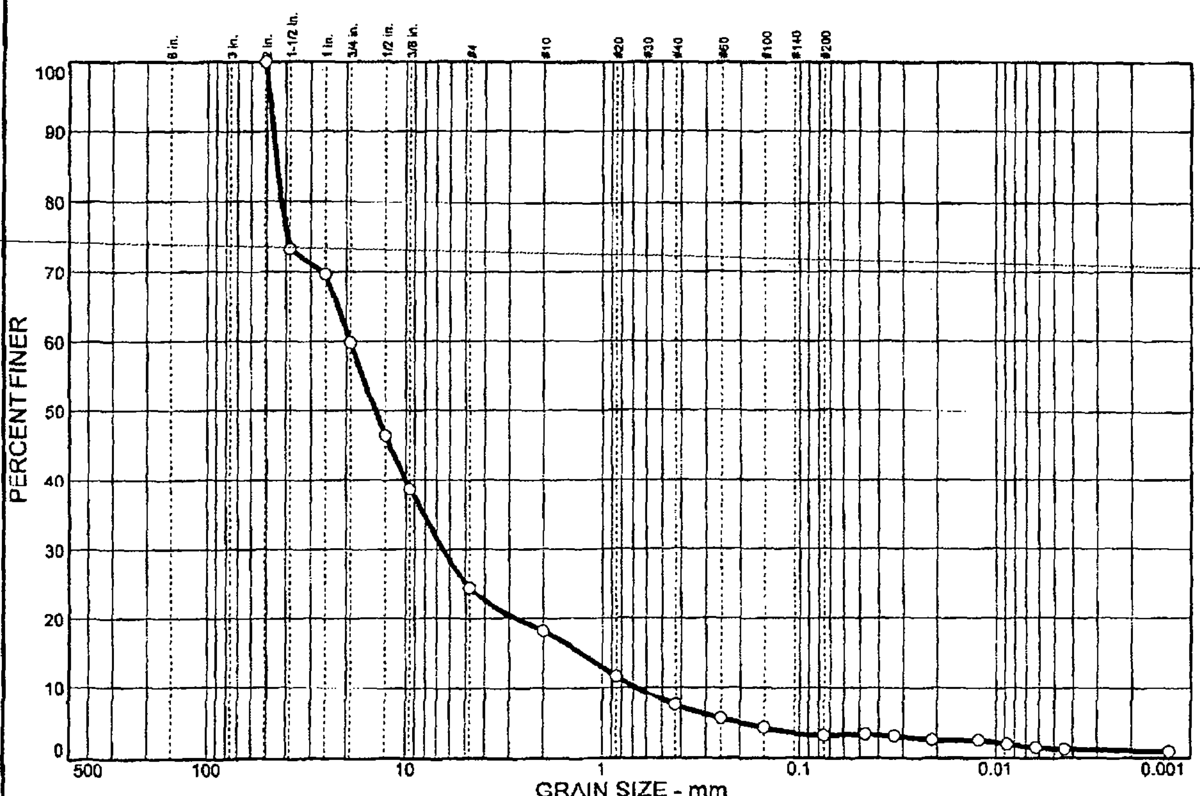
Remarks

Sample No.: RR1-1 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT
Project No: 34601 **Plate**

Particle Size Distribution Report (ASTM D422)



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	40.2	35.2	6.4	10.8	4.3	1.9	1.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2 in.	100.0		
1.5 in.	73.2		
1.0 in.	69.6		
.75 in.	59.8		
.50 in.	46.4		
.375 in.	38.7		
#4	24.6		
#10	18.2		
#20	11.6		
#40	7.4		
#60	5.5		
#100	4.2		
#200	3.1		

* (no specification provided)

Soil Description

F-C GRAVEL SIZED SLAG SOME F-C SAND TRACE SILT TRACE CLAY - BROWN

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 44.3 D_{60}= 19.2 D_{50}= 14.3
D_{30}= 6.51 D_{15}= 1.29 D_{10}= 0.678
C_u= 28.24 C_c= 3.26

Classification

USCS= GP AASHTO=

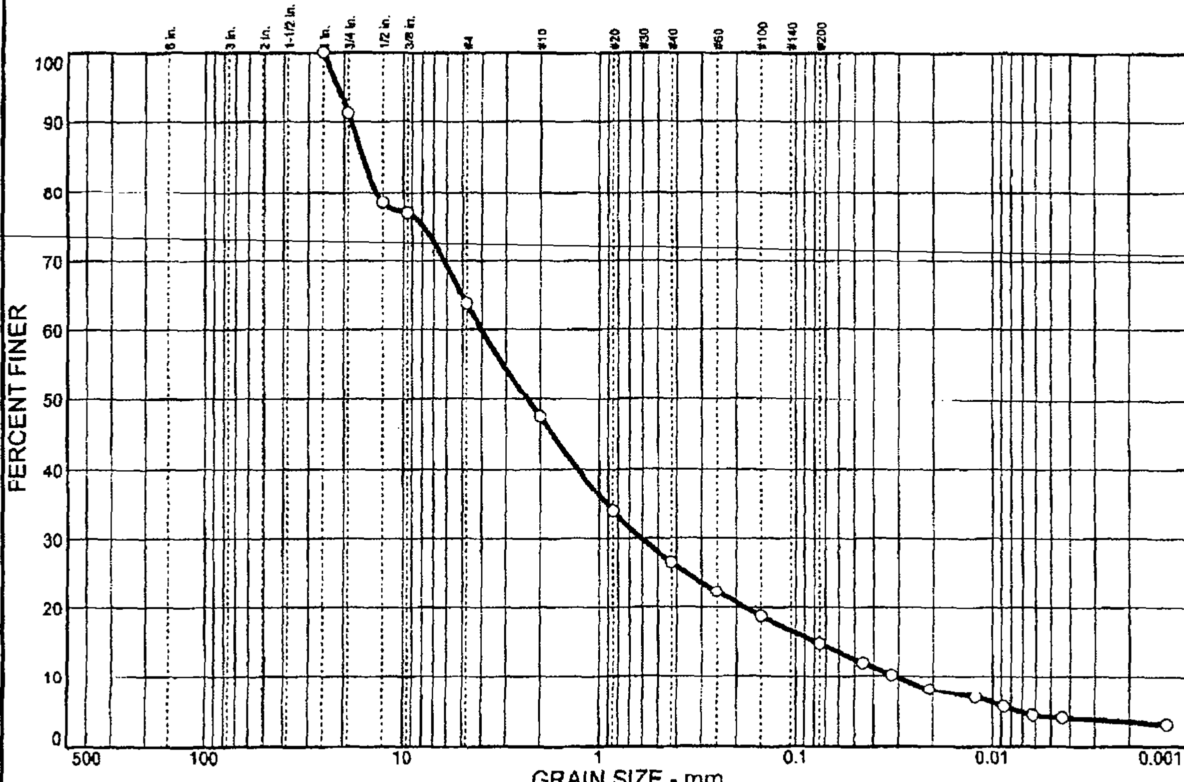
Remarks

Sample No.: RR1-2 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT
Project No: 34601 **Plate**

Particle Size Distribution Report (ASTM D422)



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	8.8	27.6	16.1	20.9	11.9	10.6	4.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0 in.	100.0		
.75 in.	91.2		
.50 in.	78.4		
.375 in.	76.9		
#4	63.6		
#10	47.5		
#20	33.8		
#40	26.6		
#60	22.3		
#100	18.7		
#200	14.7		

* (no specification provided)

Soil Description

F-C SAND SIZED AND F-C GRAVEL SIZED SLAG LITTLE SILT TRACE CLAY - GRAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 16.1 D_{60}= 4.03 D_{50}= 2.32
D_{30}= 0.613 D_{15}= 0.0791 D_{10}= 0.0313
C_u= 128.72 C_c= 2.98

Classification

USCS= SM AASHTO=

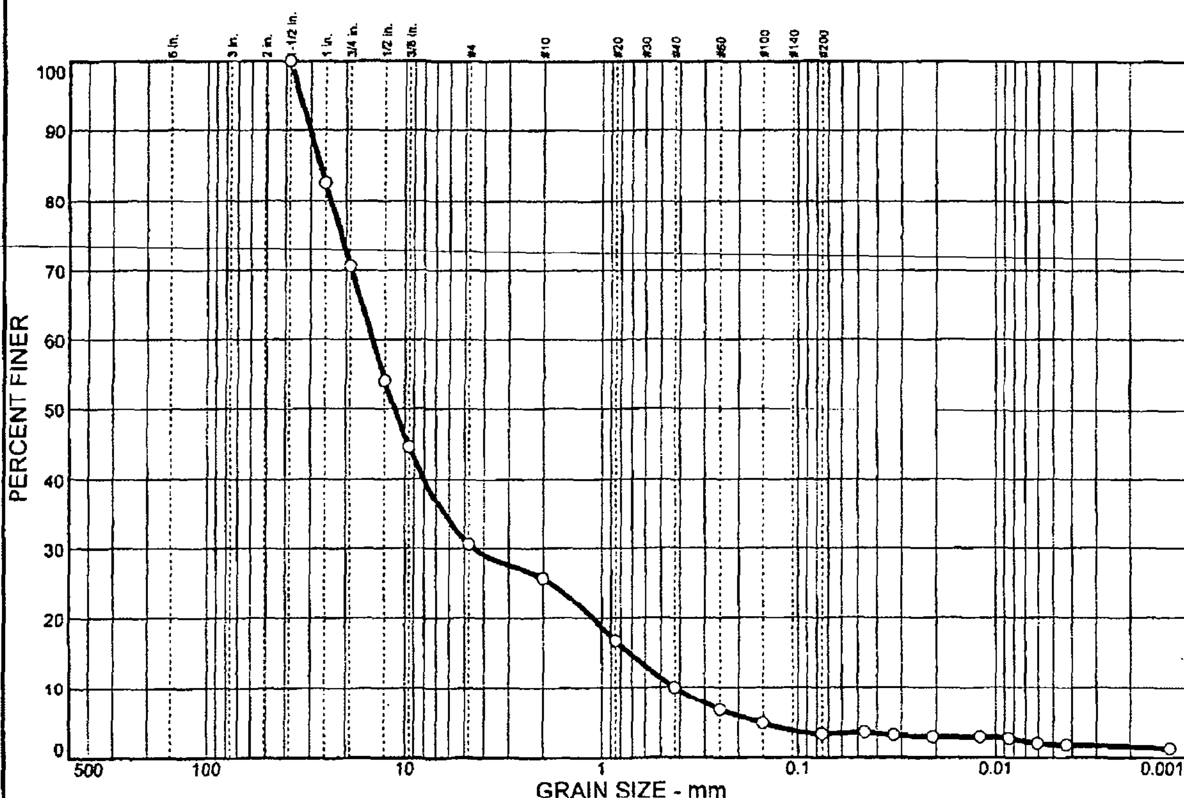
Remarks

Sample No.: RR1-3 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT
Project No: 34601 **Plate**

Particle Size Distribution Report (ASTM D422)



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	29.4	40.0	4.8	15.8	6.8	1.5	1.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1.0 in.	82.5		
.75 in.	70.6		
.50 in.	54.2		
.375 in.	44.6		
#4	30.6		
#10	25.8		
#20	16.7		
#40	10.0		
#60	6.7		
#100	4.8		
#200	3.2		

* (no specification provided)

Soil Description

F-C GRAVEL SIZED SLAG SOME F-C SAND SIZES TRACE SILT TRACE CLAY - GRAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 27.0 D_{60}= 14.7 D_{50}= 11.3
D_{30}= 4.47 D_{15}= 0.730 D_{10}= 0.425
C_u= 34.68 C_c= 3.20

Classification

USCS= GP AASHTO=

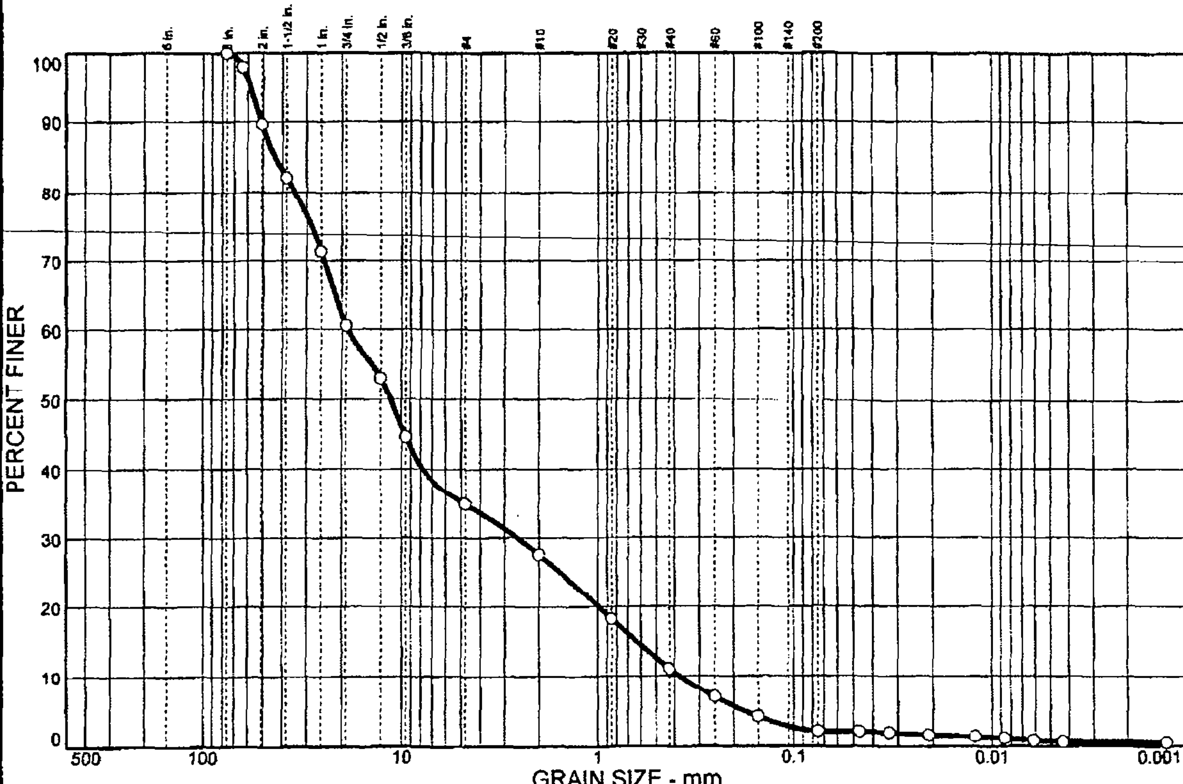
Remarks

Sample No.: RR1-4 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT
Project No: 34601 **Plate**

Particle Size Distribution Report (ASTM D422)



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	39.5	25.7	7.2	16.6	9.0	1.3	0.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
2.5 in.	98.0		
2 in.	89.6		
1.5 in.	82.1		
1 in.	71.3		
.75 in.	60.5		
.50 in.	53.2		
.375 in.	44.6		
#4	34.8		
#10	27.6		
#20	18.2		
#40	11.0		
#60	6.9		
#100	4.1		
#200	2.0		

* (no specification provided)

Soil Description

F-C GRAVEL SIZED SLAG SOME F-C SAND SIZES TRACE SILT - GRAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 43.5 D_{60}= 18.7 D_{50}= 11.3
D_{30}= 2.59 D_{15}= 0.636 D_{10}= 0.379
C_u= 49.35 C_c= 0.94

Classification

USCS= GP AASHTO=

Remarks

Sample No.: RR2-11 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT
Project No: 34601 **Plate**

APPENDIX D

Emission Rates

APPENDIX E

SCREEN3 Dispersion Model Output Files

Residue Pile CPH-6

SCREEN3 Output File
10-micron Emission Rate

03/29/2005
12:53:46

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc Screening - CPH-6 - 10 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.297000E-06
SOURCE HEIGHT (M) = 4.5700
LENGTH OF LARGER SIDE (M) = 6.4600
LENGTH OF SMALLER SIDE (M) = 6.4600
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.1636E-07	1	1.0	1.0	320.0	4.57	45.
100.	0.7547E-01	5	1.0	1.0	10000.0	4.57	35.
200.	0.6496E-01	6	1.0	1.0	10000.0	4.57	31.
300.	0.4425E-01	6	1.0	1.0	10000.0	4.57	34.
400.	0.3072E-01	6	1.0	1.0	10000.0	4.57	43.
500.	0.2242E-01	6	1.0	1.0	10000.0	4.57	31.
600.	0.1708E-01	6	1.0	1.0	10000.0	4.57	36.
700.	0.1347E-01	6	1.0	1.0	10000.0	4.57	34.
800.	0.1104E-01	6	1.0	1.0	10000.0	4.57	39.
900.	0.9253E-02	6	1.0	1.0	10000.0	4.57	31.

1000.	0.7887E-02	6	1.0	1.0	10000.0	4.57	31.
1100.	0.6850E-02	6	1.0	1.0	10000.0	4.57	31.
1200.	0.6020E-02	6	1.0	1.0	10000.0	4.57	31.
1300.	0.5342E-02	6	1.0	1.0	10000.0	4.57	31.
1400.	0.4782E-02	6	1.0	1.0	10000.0	4.57	39.
1500.	0.4312E-02	6	1.0	1.0	10000.0	4.57	31.
1600.	0.3913E-02	6	1.0	1.0	10000.0	4.57	39.

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

90. 0.7662E-01 5 1.0 1.0 10000.0 4.57 43.

****

*** SUMMARY OF SCREEN MODEL RESULTS ***

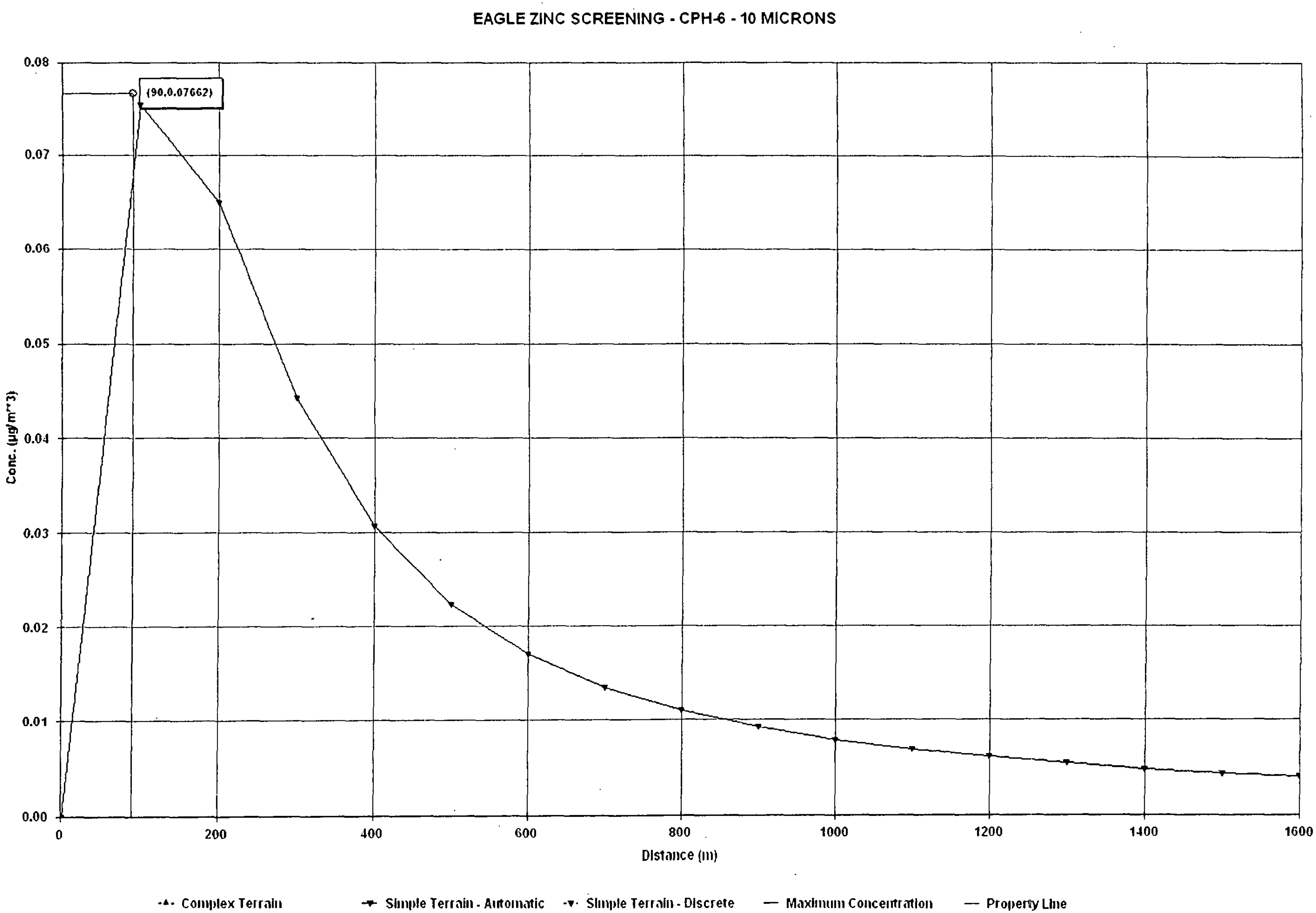
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	0.7662E-01	90.	0.

****

** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

****


EAGLE ZINC SCREENING - CPH-6 - 10 MICRONS
(90,0.07662)
Conc. (µg/m^3)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0
200
400
600
800
1000
1200
1400
1600
Distance (m)
Complex Terrain
Simple Terrain - Automatic
Simple Terrain - Discrete
Maximum Concentration
Property Line

Residue Pile CPH-6

SCREEN3 Output File
30-micron Emission Rate

03/29/2005
12:51:27

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc Screening - CPH-6 - 30 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.593000E-06
SOURCE HEIGHT (M) = 4.5700
LENGTH OF LARGER SIDE (M) = 6.4600
LENGTH OF SMALLER SIDE (M) = 6.4600
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.3266E-07	1	1.0	1.0	320.0	4.57	45.
100.	0.1507	5	1.0	1.0	10000.0	4.57	35.
200.	0.1297	6	1.0	1.0	10000.0	4.57	31.
300.	0.8836E-01	6	1.0	1.0	10000.0	4.57	34.
400.	0.6134E-01	6	1.0	1.0	10000.0	4.57	43.
500.	0.4476E-01	6	1.0	1.0	10000.0	4.57	31.
600.	0.3411E-01	6	1.0	1.0	10000.0	4.57	36.
700.	0.2690E-01	6	1.0	1.0	10000.0	4.57	34.
800.	0.2205E-01	6	1.0	1.0	10000.0	4.57	39.
900.	0.1847E-01	6	1.0	1.0	10000.0	4.57	31.

1000.	0.1575E-01	6	1.0	1.0	10000.0	4.57	31.
1100.	0.1368E-01	6	1.0	1.0	10000.0	4.57	31.
1200.	0.1202E-01	6	1.0	1.0	10000.0	4.57	31.
1300.	0.1067E-01	6	1.0	1.0	10000.0	4.57	31.
1400.	0.9547E-02	6	1.0	1.0	10000.0	4.57	39.
1500.	0.8609E-02	6	1.0	1.0	10000.0	4.57	31.
1600.	0.7813E-02	6	1.0	1.0	10000.0	4.57	39.

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

90.	0.1530	5	1.0	1.0	10000.0	4.57	43.

****

*** SUMMARY OF SCREEN MODEL RESULTS ***

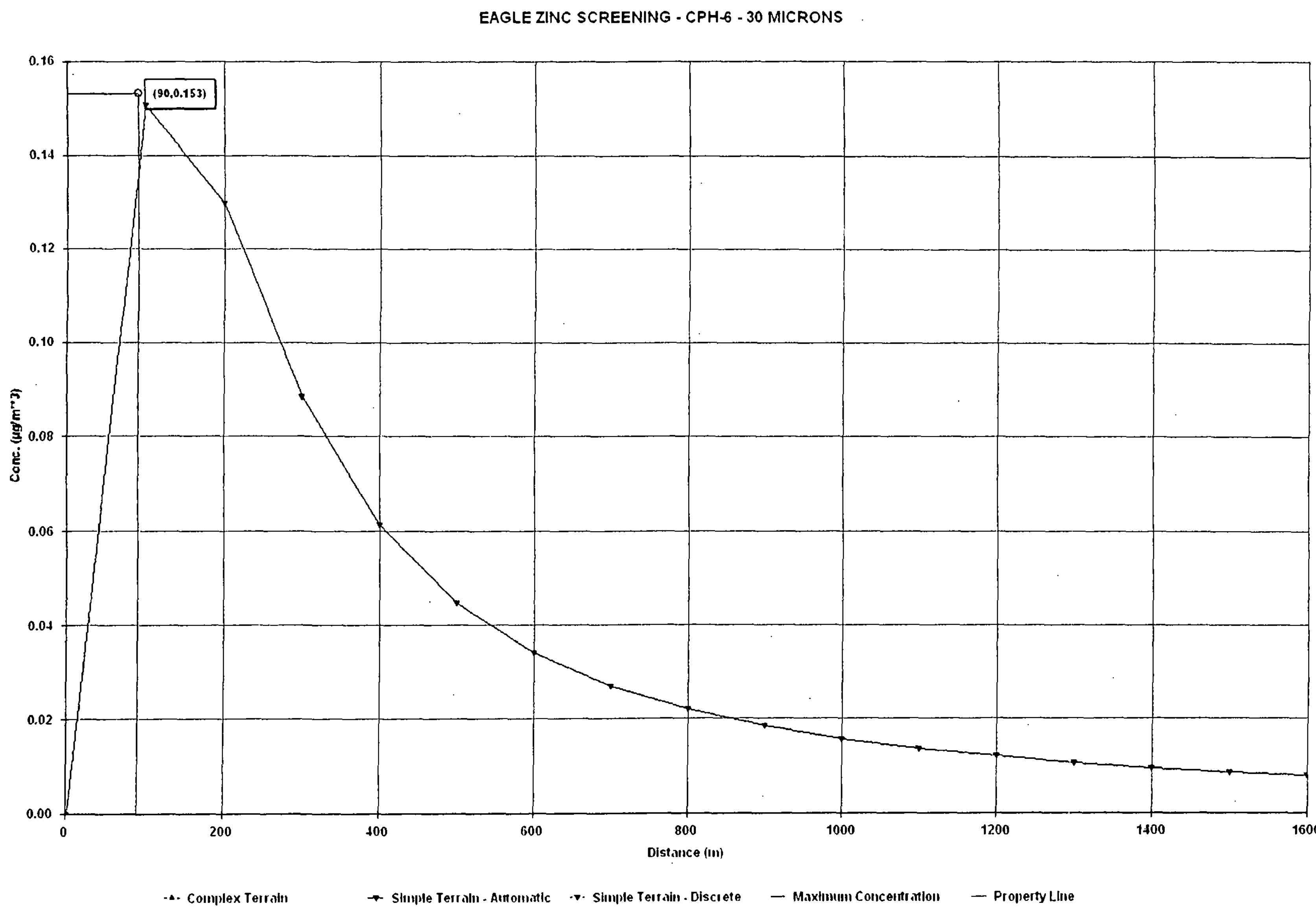
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	0.1530	90.	0.

****

** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

****


EAGLE ZINC SCREENING - CPH-6 - 30 MICRONS
(90,0.153)
Conc. (µg/m**3)
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0
200
400
600
800
1000
1200
1400
1600
Distance (m)
Complex Terrain
Simple Terrain - Automatic
Simple Terrain - Discrete
Maximum Concentration
Property Line

<u>Residue Pile CPH-9</u>

SCREEN3 Output File
10-micron Emission Rate

03/29/2005
12:48:45

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc Screening - CPH-9 - 10 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.297000E-06
SOURCE HEIGHT (M) = 5.4900
LENGTH OF LARGER SIDE (M) = 7.8200
LENGTH OF SMALLER SIDE (M) = 7.8200
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.6306E-08	1	1.0	1.0	320.0	5.49	45.
100.	0.7481E-01	5	1.0	1.0	10000.0	5.49	40.
200.	0.7127E-01	6	1.0	1.0	10000.0	5.49	36.
300.	0.5568E-01	6	1.0	1.0	10000.0	5.49	42.
400.	0.4087E-01	6	1.0	1.0	10000.0	5.49	31.
500.	0.3069E-01	6	1.0	1.0	10000.0	5.49	41.
600.	0.2378E-01	6	1.0	1.0	10000.0	5.49	31.
700.	0.1897E-01	6	1.0	1.0	10000.0	5.49	38.
800.	0.1566E-01	6	1.0	1.0	10000.0	5.49	33.
900.	0.1318E-01	6	1.0	1.0	10000.0	5.49	31.

1000.	0.1128E-01	6	1.0	1.0	10000.0	5.49	31.
1100.	0.9823E-02	6	1.0	1.0	10000.0	5.49	33.
1200.	0.8652E-02	6	1.0	1.0	10000.0	5.49	31.
1300.	0.7693E-02	6	1.0	1.0	10000.0	5.49	31.
1400.	0.6898E-02	6	1.0	1.0	10000.0	5.49	33.
1500.	0.6228E-02	6	1.0	1.0	10000.0	5.49	40.
1600.	0.5659E-02	6	1.0	1.0	10000.0	5.49	33.

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

51. 0.7988E-01 3 1.0 1.0 320.0 5.49 45.

****

*** SUMMARY OF SCREEN MODEL RESULTS ***

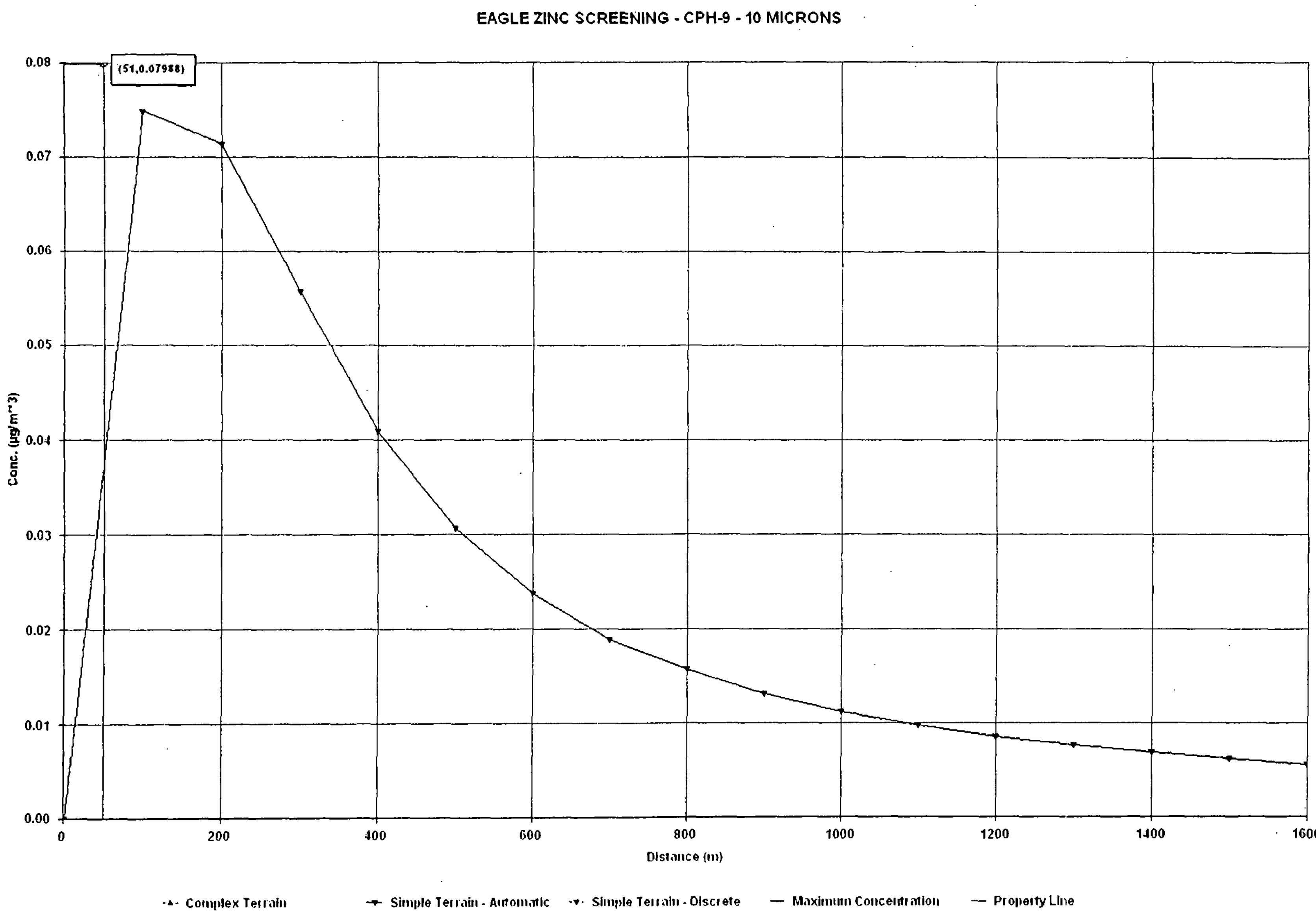
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	0.7988E-01	51.	0.

****

** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

****



EAGLE ZINC SCREENING - CPH-9 - 10 MICRONS
(51,0.07988)
Conc. (µg/m^3)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0
200
400
600
800
1000
1200
1400
1600
Distance (m)
Complex Terrain
Simple Terrain - Automatic
Simple Terrain - Discrete
Maximum Concentration
Property Line

Residue Pile CPH-9

SCREEN3 Output File
30-micron Emission Rate

03/29/2005
12:45:55

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc Screening - CPH-9 - 30 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.593000E-06
SOURCE HEIGHT (M) = 5.4900
LENGTH OF LARGER SIDE (M) = 7.8200
LENGTH OF SMALLER SIDE (M) = 7.8200
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.1259E-07	1	1.0	1.0	320.0	5.49	45.
100.	0.1494	5	1.0	1.0	10000.0	5.49	40.
200.	0.1423	6	1.0	1.0	10000.0	5.49	36.
300.	0.1112	6	1.0	1.0	10000.0	5.49	42.
400.	0.8159E-01	6	1.0	1.0	10000.0	5.49	31.
500.	0.6127E-01	6	1.0	1.0	10000.0	5.49	41.
600.	0.4749E-01	6	1.0	1.0	10000.0	5.49	31.
700.	0.3788E-01	6	1.0	1.0	10000.0	5.49	38.
800.	0.3127E-01	6	1.0	1.0	10000.0	5.49	33.
900.	0.2632E-01	6	1.0	1.0	10000.0	5.49	31.

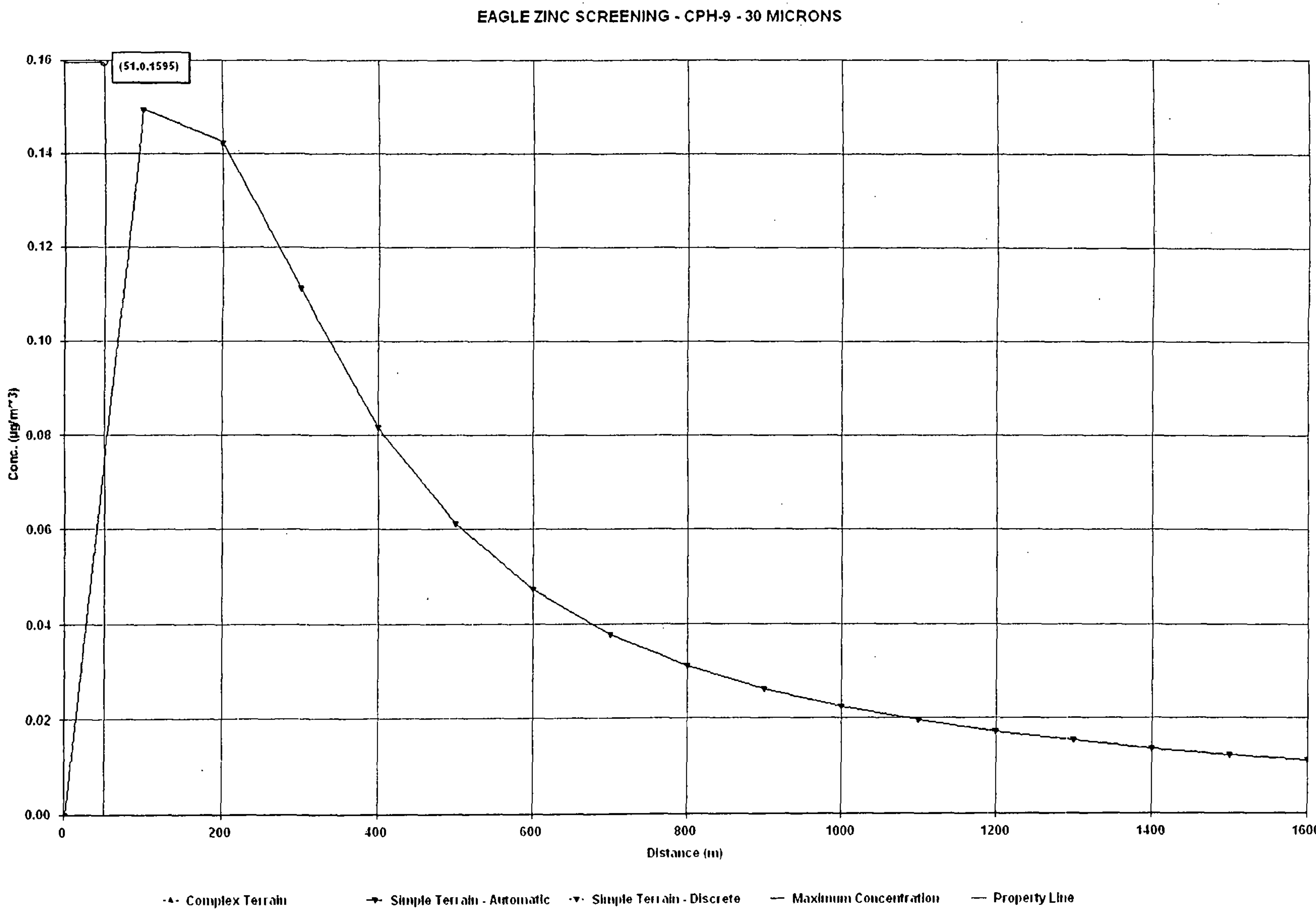
```
1000. 0.2252E-01   6   1.0   1.0 10000.0   5.49   31.
1100. 0.1961E-01   6   1.0   1.0 10000.0   5.49   33.
1200. 0.1727E-01   6   1.0   1.0 10000.0   5.49   31.
1300. 0.1536E-01   6   1.0   1.0 10000.0   5.49   31.
1400. 0.1377E-01   6   1.0   1.0 10000.0   5.49   33.
1500. 0.1244E-01   6   1.0   1.0 10000.0   5.49   40.
1600. 0.1130E-01   6   1.0   1.0 10000.0   5.49   33.

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND     1. M:
  51. 0.1595       3   1.0   1.0  320.0   5.49   45.

  **************************************
  *** SUMMARY OF SCREEN MODEL RESULTS ***
  **************************************

 CALCULATION      MAX CONC    DIST TO   TERRAIN
  PROCEDURE       (UG/M**3)   MAX (M)   HT (M)
--------------   -----------  -------   -------
SIMPLE TERRAIN    0.1595         51.       0.


***************************************************
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
***************************************************
```


EAGLE ZINC SCREENING - CPH-9 - 30 MICRONS
(51,0.1595)
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Conc. (µg/m^3)
0
200
400
600
800
1000
1200
1400
1600
Distance (m)
Complex Terrain
Simple Terrain - Automatic
Simple Terrain - Discrete
Maximum Concentration
Property Line

<u>Residue Pile NP-15</u>

SCREEN3 Output File
10-micron Emission Rate

03/31/2005
12:28:07

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc - NP-15 - 10 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.297000E-06
SOURCE HEIGHT (M) = 3.6600
LENGTH OF LARGER SIDE (M) = 9.8500
LENGTH OF SMALLER SIDE (M) = 9.8500
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.5616E-03	1	1.0	1.0	320.0	3.66	45.
100.	0.2277	6	1.0	1.0	10000.0	3.66	45.
200.	0.1822	6	1.0	1.0	10000.0	3.66	39.
300.	0.1138	6	1.0	1.0	10000.0	3.66	32.
400.	0.7623E-01	6	1.0	1.0	10000.0	3.66	45.
500.	0.5458E-01	6	1.0	1.0	10000.0	3.66	31.
600.	0.4113E-01	6	1.0	1.0	10000.0	3.66	43.
700.	0.3221E-01	6	1.0	1.0	10000.0	3.66	31.
800.	0.2629E-01	6	1.0	1.0	10000.0	3.66	31.
900.	0.2196E-01	6	1.0	1.0	10000.0	3.66	39.

1000.	0.1866E-01	6	1.0	1.0	10000.0	3.66	33.
1100.	0.1618E-01	6	1.0	1.0	10000.0	3.66	31.
1200.	0.1419E-01	6	1.0	1.0	10000.0	3.66	38.
1300.	0.1258E-01	6	1.0	1.0	10000.0	3.66	44.
1400.	0.1125E-01	6	1.0	1.0	10000.0	3.66	31.
1500.	0.1013E-01	6	1.0	1.0	10000.0	3.66	31.
1600.	0.9190E-02	6	1.0	1.0	10000.0	3.66	31.

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

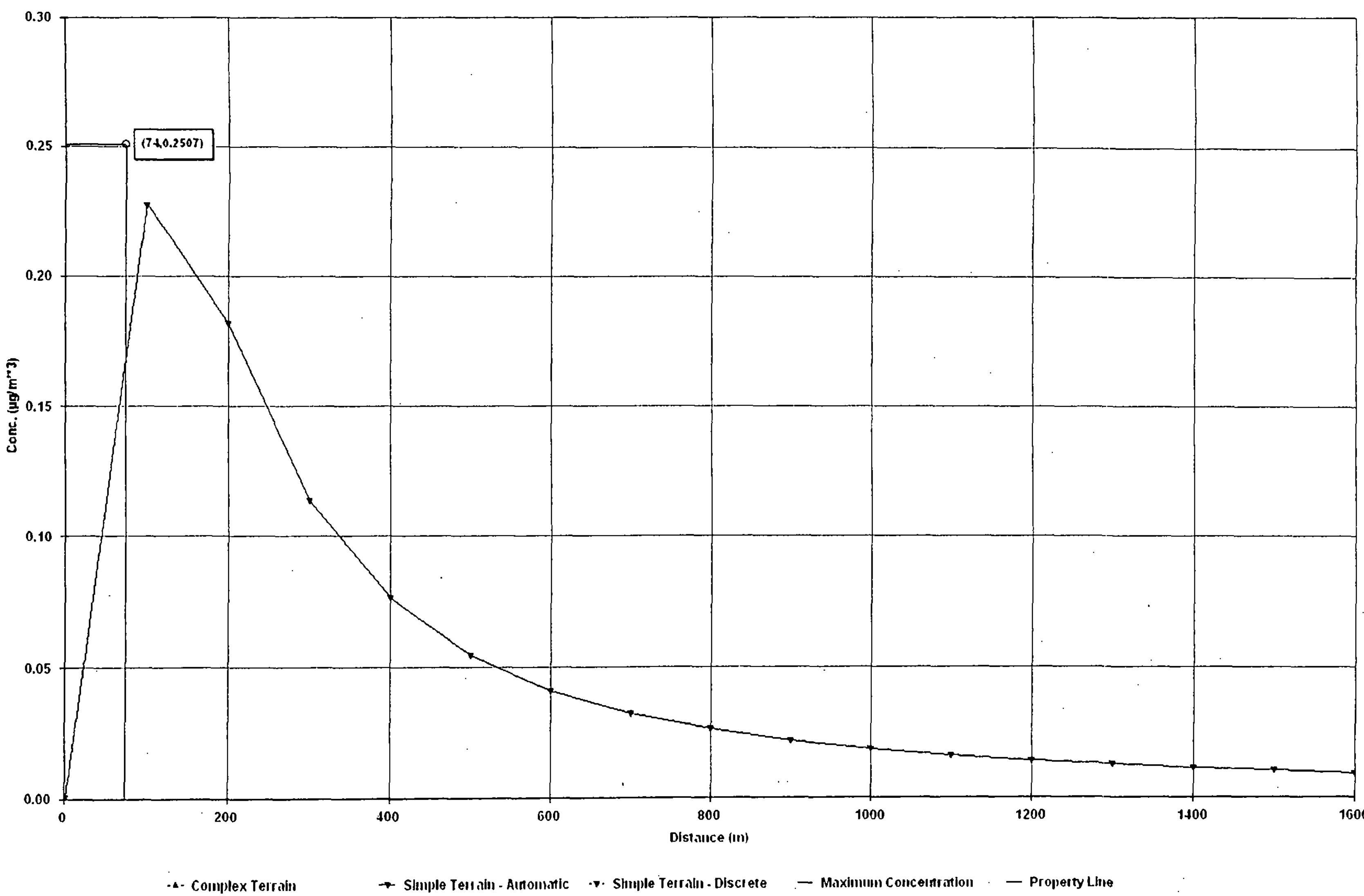
74.	0.2507	5	1.0	1.0	10000.0	3.66	45.

```
***************************************
*** SUMMARY OF SCREEN MODEL RESULTS ***
***************************************
```

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	0.2507	74.	0.

```
***************************************************
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
***************************************************
```

EAGLE ZINC - NP-15 - 10 MICRONS



Residue Pile NP-15

SCREEN3 Output File
30-micron Emission Rate

03/31/2005
12:25:15

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc - NP-15 - 30 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.593000E-06
SOURCE HEIGHT (M) = 3.6600
LENGTH OF LARGER SIDE (M) = 9.8500
LENGTH OF SMALLER SIDE (M) = 9.8500
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.1121E-02	1	1.0	1.0	320.0	3.66	45.
100.	0.4546	6	1.0	1.0	10000.0	3.66	45.
200.	0.3638	6	1.0	1.0	10000.0	3.66	39.
300.	0.2272	6	1.0	1.0	10000.0	3.66	32.
400.	0.1522	6	1.0	1.0	10000.0	3.66	45.
500.	0.1090	6	1.0	1.0	10000.0	3.66	31.
600.	0.8212E-01	6	1.0	1.0	10000.0	3.66	43.
700.	0.6431E-01	6	1.0	1.0	10000.0	3.66	31.
800.	0.5250E-01	6	1.0	1.0	10000.0	3.66	31.
900.	0.4384E-01	6	1.0	1.0	10000.0	3.66	39.

1000.	0.3727E-01	6	1.0	1.0	10000.0	3.66	33.
1100.	0.3230E-01	6	1.0	1.0	10000.0	3.66	31.
1200.	0.2834E-01	6	1.0	1.0	10000.0	3.66	38.
1300.	0.2512E-01	6	1.0	1.0	10000.0	3.66	44.
1400.	0.2246E-01	6	1.0	1.0	10000.0	3.66	31.
1500.	0.2023E-01	6	1.0	1.0	10000.0	3.66	31.
1600.	0.1835E-01	6	1.0	1.0	10000.0	3.66	31.

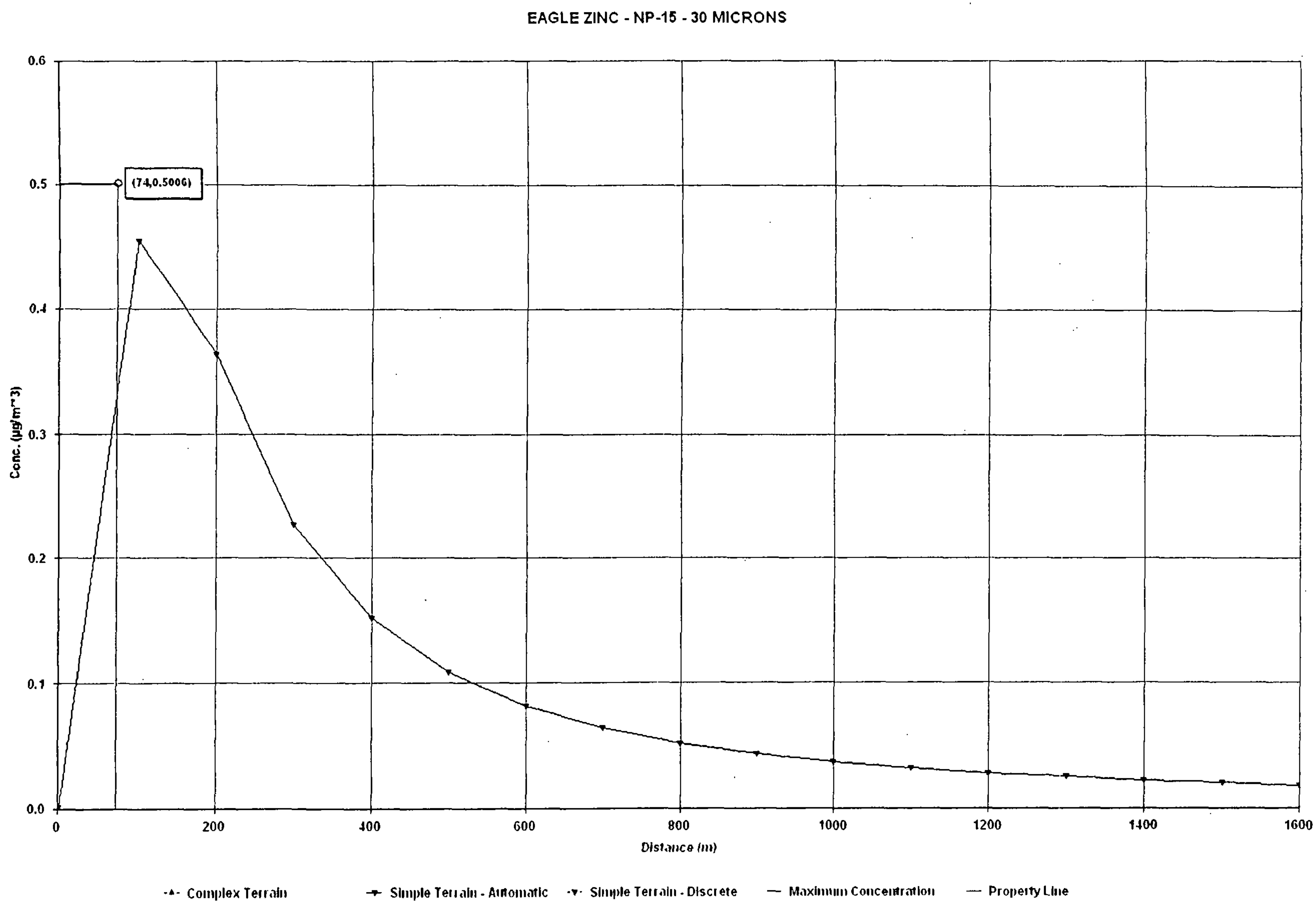
MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

74.	0.5006	5	1.0	1.0	10000.0	3.66	45.

```
***************************************
*** SUMMARY OF SCREEN MODEL RESULTS ***
***************************************
```

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	0.5006	74.	0.

```
***************************************************
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
***************************************************
```



EAGLE ZINC - NP-15 - 30 MICRONS
(74,0.5006)
Conc. (µg/m^3)
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
200
400
600
800
1000
1200
1400
1600
Distance (m)
Complex Terrain
Simple Terrain - Automatic
Simple Terrain - Discrete
Maximum Concentration
Property Line

Residue Pile NP-16

SCREEN3 Output File
10-micron Emission Rate

03/31/2005
12:33:59

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc - NP-16 - 10 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.297000E-06
SOURCE HEIGHT (M) = 7.6200
LENGTH OF LARGER SIDE (M) = 11.1000
LENGTH OF SMALLER SIDE (M) = 11.1000
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.1815E-08	1	1.0	1.0	320.0	7.62	45.
100.	0.7399E-01	4	1.0	1.0	320.0	7.62	43.
200.	0.7336E-01	5	1.0	1.0	10000.0	7.62	39.
300.	0.7075E-01	6	1.0	1.0	10000.0	7.62	38.
400.	0.6144E-01	6	1.0	1.0	10000.0	7.62	45.
500.	0.5033E-01	6	1.0	1.0	10000.0	7.62	37.
600.	0.4106E-01	6	1.0	1.0	10000.0	7.62	31.
700.	0.3387E-01	6	1.0	1.0	10000.0	7.62	45.
800.	0.2853E-01	6	1.0	1.0	10000.0	7.62	31.
900.	0.2439E-01	6	1.0	1.0	10000.0	7.62	31.

1000.	0.2112E-01	6	1.0	1.0	10000.0	7.62	40.
1100.	0.1855E-01	6	1.0	1.0	10000.0	7.62	35.
1200.	0.1645E-01	6	1.0	1.0	10000.0	7.62	32.
1300.	0.1471E-01	6	1.0	1.0	10000.0	7.62	34.
1400.	0.1325E-01	6	1.0	1.0	10000.0	7.62	39.
1500.	0.1201E-01	6	1.0	1.0	10000.0	7.62	45.
1600.	0.1095E-01	6	1.0	1.0	10000.0	7.62	32.

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

73.	0.8302E-01	3	1.0	1.0	320.0	7.62	36.

****

*** SUMMARY OF SCREEN MODEL RESULTS ***

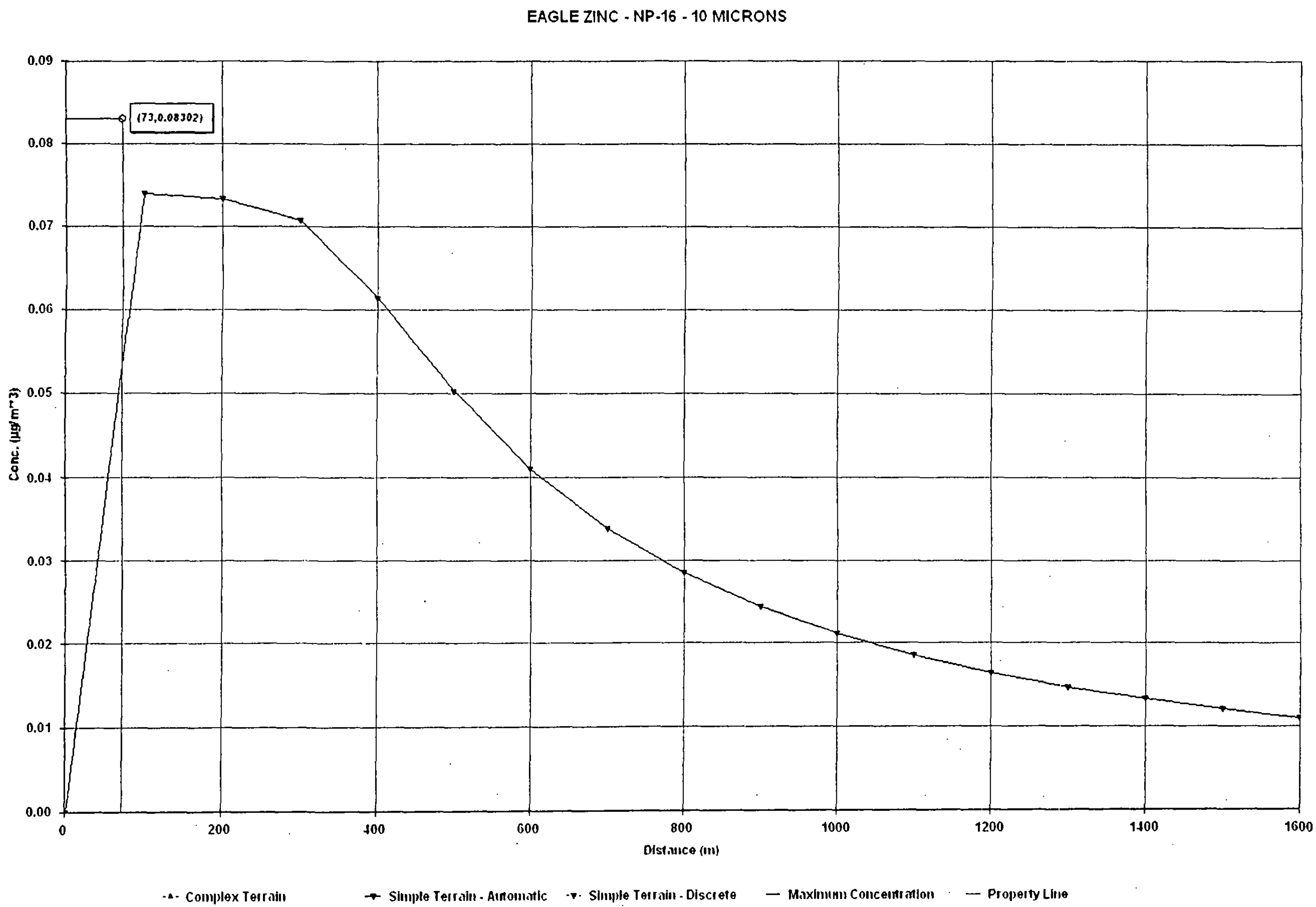
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	0.8302E-01	73.	0.

****

** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

****



EAGLE ZINC - NP-16 - 10 MICRONS
(73,0.08302)
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
Conc. (µg/m^3)
0
200
400
600
800
1000
1200
1400
1600
Distance (m)
Complex Terrain
Simple Terrain - Automatic
Simple Terrain - Discrete
Maximum Concentration
Property Line

<u>Residue Pile NP-16</u>

SCREEN3 Output File
30-micron Emission Rate

03/31/2005
12:31:13

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc - NP-16 - 30 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.593000E-06
SOURCE HEIGHT (M) = 7.6200
LENGTH OF LARGER SIDE (M) = 11.1000
LENGTH OF SMALLER SIDE (M) = 11.1000
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.3624E-08	1	1.0	1.0	320.0	7.62	45.
100.	0.1477	4	1.0	1.0	320.0	7.62	43.
200.	0.1465	5	1.0	1.0	10000.0	7.62	39.
300.	0.1413	6	1.0	1.0	10000.0	7.62	38.
400.	0.1227	6	1.0	1.0	10000.0	7.62	45.
500.	0.1005	6	1.0	1.0	10000.0	7.62	37.
600.	0.8199E-01	6	1.0	1.0	10000.0	7.62	31.
700.	0.6762E-01	6	1.0	1.0	10000.0	7.62	45.
800.	0.5697E-01	6	1.0	1.0	10000.0	7.62	31.
900.	0.4870E-01	6	1.0	1.0	10000.0	7.62	31.

1000.	0.4216E-01	6	1.0	1.0	10000.0	7.62	40.
1100.	0.3703E-01	6	1.0	1.0	10000.0	7.62	35.
1200.	0.3284E-01	6	1.0	1.0	10000.0	7.62	32.
1300.	0.2936E-01	6	1.0	1.0	10000.0	7.62	34.
1400.	0.2645E-01	6	1.0	1.0	10000.0	7.62	39.
1500.	0.2398E-01	6	1.0	1.0	10000.0	7.62	45.
1600.	0.2186E-01	6	1.0	1.0	10000.0	7.62	32.

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

73.	0.1658	3	1.0	1.0	320.0	7.62	36.

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***************************************
*** SUMMARY OF SCREEN MODEL RESULTS ***
***************************************
```

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	0.1658	73.	0.

```
***************************************************
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
***************************************************
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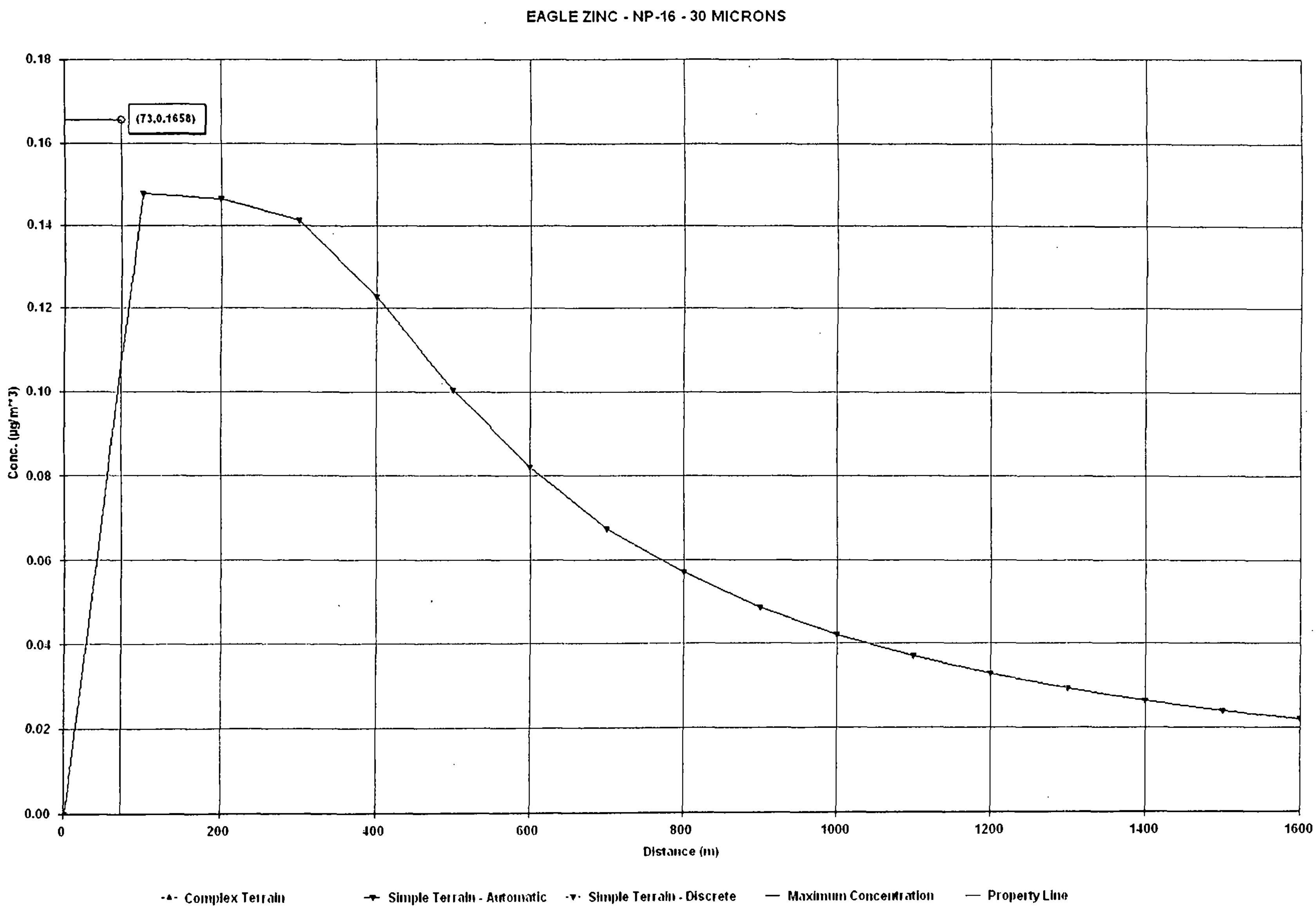


EAGLE ZINC - NP-16 - 30 MICRONS
(73,0.1658)
Conc. (µg/m^3)
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0
200
400
600
800
1000
1200
1400
1600
Distance (m)
Complex Terrain
Simple Terrain - Automatic
Simple Terrain - Discrete
Maximum Concentration
Property Line

<u>Residue Pile RCO-10</u>

SCREEN3 Output File
10-micron Emission Rate

03/29/2005
12:34:03

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc Screening - RCO-10 - 10 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.297000E-06
SOURCE HEIGHT (M) = 6.1000
LENGTH OF LARGER SIDE (M) = 10.8700
LENGTH OF SMALLER SIDE (M) = 10.8700
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.5122E-06	1	1.0	1.0	320.0	6.10	45.
100.	0.1154	4	1.0	1.0	320.0	6.10	41.
200.	0.1074	6	1.0	1.0	10000.0	6.10	43.
300.	0.9450E-01	6	1.0	1.0	10000.0	6.10	39.
400.	0.7275E-01	6	1.0	1.0	10000.0	6.10	45.
500.	0.5599E-01	6	1.0	1.0	10000.0	6.10	36.
600.	0.4403E-01	6	1.0	1.0	10000.0	6.10	35.
700.	0.3545E-01	6	1.0	1.0	10000.0	6.10	43.
800.	0.2943E-01	6	1.0	1.0	10000.0	6.10	31.
900.	0.2489E-01	6	1.0	1.0	10000.0	6.10	31.

1000.	0.2137E-01	6	1.0	1.0	10000.0	6.10	39.
1100.	0.1865E-01	6	1.0	1.0	10000.0	6.10	31.
1200.	0.1646E-01	6	1.0	1.0	10000.0	6.10	32.
1300.	0.1466E-01	6	1.0	1.0	10000.0	6.10	36.
1400.	0.1316E-01	6	1.0	1.0	10000.0	6.10	31.
1500.	0.1189E-01	6	1.0	1.0	10000.0	6.10	41.
1600.	0.1082E-01	6	1.0	1.0	10000.0	6.10	31.

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

58.	0.1211	3	1.0	1.0	320.0	6.10	43.

****

*** SUMMARY OF SCREEN MODEL RESULTS ***

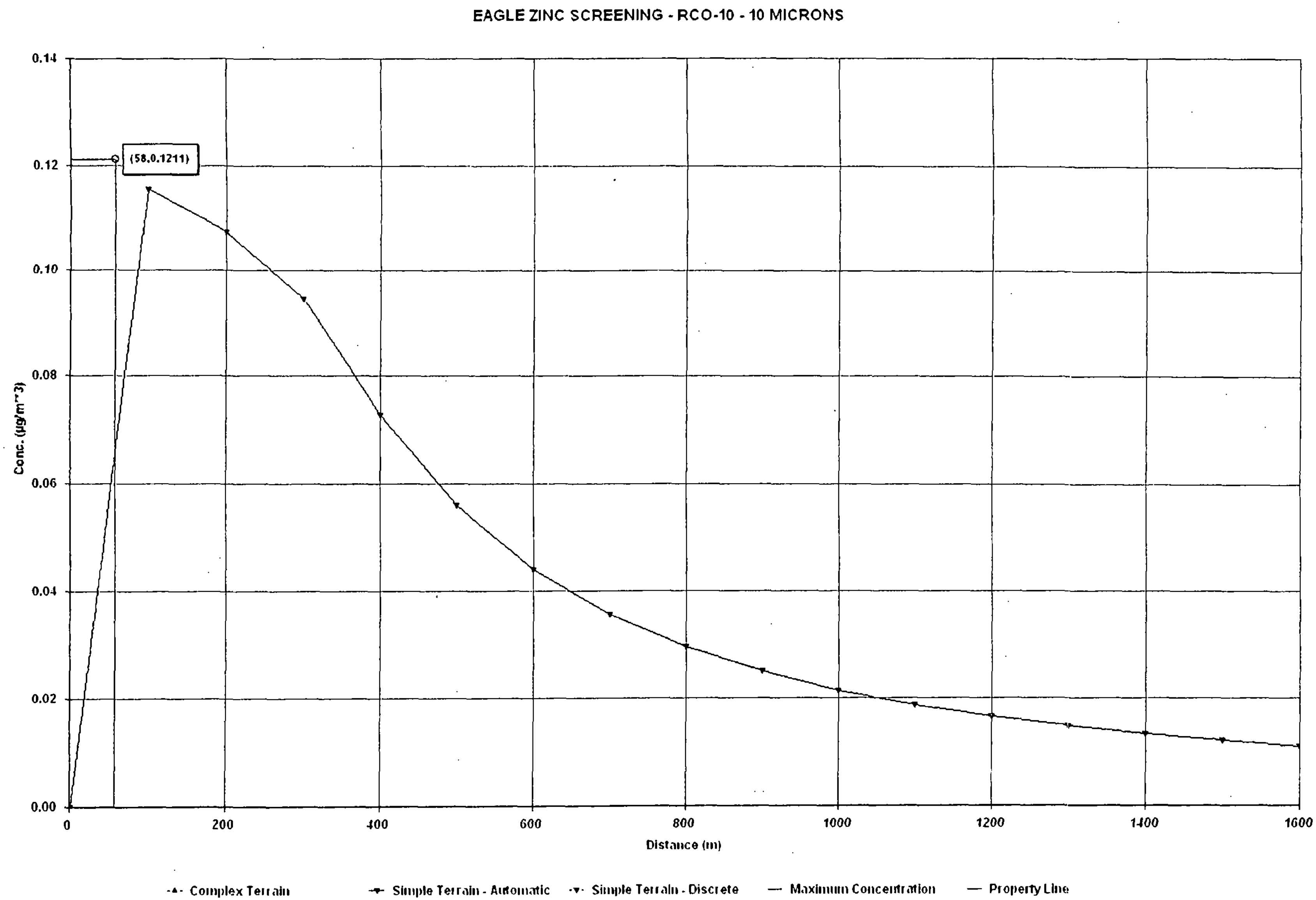
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	0.1211	58.	0.

****

** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

****


EAGLE ZINC SCREENING - RCO-10 - 10 MICRONS
(58,0.1211)
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Conc. (µg/m**3)
0
200
400
600
800
1000
1200
1400
1600
Distance (m)
Complex Terrain
Simple Terrain - Automatic
Simple Terrain - Discrete
Maximum Concentration
Property Line

Residue Pile RCO-10

SCREEN3 Output File
30-micron Emission Rate

03/29/2005
12:31:00

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc Screening - RCO-10 - 30 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.593000E-06
SOURCE HEIGHT (M) = 6.1000
LENGTH OF LARGER SIDE (M) = 10.8700
LENGTH OF SMALLER SIDE (M) = 10.8700
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.1023E-05	1	1.0	1.0	320.0	6.10	45.
100.	0.2304	4	1.0	1.0	320.0	6.10	41.
200.	0.2145	6	1.0	1.0	10000.0	6.10	43.
300.	0.1887	6	1.0	1.0	10000.0	6.10	39.
400.	0.1453	6	1.0	1.0	10000.0	6.10	45.
500.	0.1118	6	1.0	1.0	10000.0	6.10	36.
600.	0.8791E-01	6	1.0	1.0	10000.0	6.10	35.
700.	0.7078E-01	6	1.0	1.0	10000.0	6.10	43.
800.	0.5877E-01	6	1.0	1.0	10000.0	6.10	31.
900.	0.4970E-01	6	1.0	1.0	10000.0	6.10	31.

1000.	0.4267E-01	6	1.0	1.0	10000.0	6.10	39.
1100.	0.3724E-01	6	1.0	1.0	10000.0	6.10	31.
1200.	0.3286E-01	6	1.0	1.0	10000.0	6.10	32.
1300.	0.2926E-01	6	1.0	1.0	10000.0	6.10	36.
1400.	0.2627E-01	6	1.0	1.0	10000.0	6.10	31.
1500.	0.2375E-01	6	1.0	1.0	10000.0	6.10	41.
1600.	0.2160E-01	6	1.0	1.0	10000.0	6.10	31.

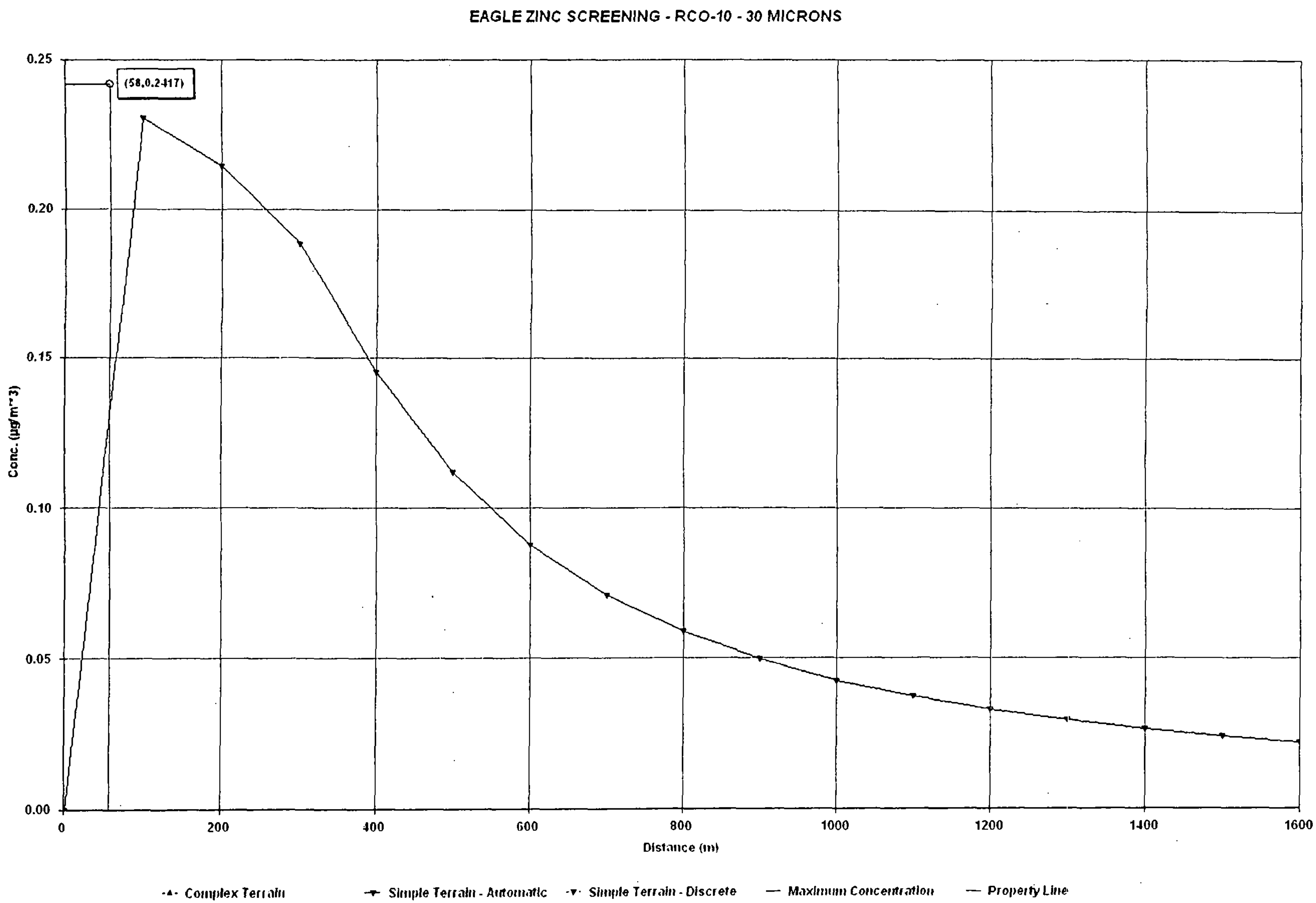
MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

58. 0.2417 3 1.0 1.0 320.0 6.10 43.

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	0.2417	58.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****


EAGLE ZINC SCREENING - RCO-10 - 30 MICRONS
(58,0.2417)
0.25
0.20
0.15
0.10
0.05
0.00
Conc. (µg/m^3)
0
200
400
600
800
1000
1200
1400
1600
Distance (m)
Complex Terrain
Simple Terrain - Automatic
Simple Terrain - Discrete
Maximum Concentration
Property Line

Residue Pile RR1-3

SCREEN3 Output File
10-micron Emission Rate

03/29/2005
12:40:36

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc Screening - RR1-3 - 10 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.573000E-06
SOURCE HEIGHT (M) = 2.4400
LENGTH OF LARGER SIDE (M) = 18.5200
LENGTH OF SMALLER SIDE (M) = 6.1700
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.1937	1	1.0	1.0	320.0	2.44	0.
100.	1.156	6	1.0	1.0	10000.0	2.44	0.
200.	0.5380	6	1.0	1.0	10000.0	2.44	0.
300.	0.2964	6	1.0	1.0	10000.0	2.44	0.
400.	0.1889	6	1.0	1.0	10000.0	2.44	0.
500.	0.1318	6	1.0	1.0	10000.0	2.44	0.
600.	0.9772E-01	6	1.0	1.0	10000.0	2.44	0.
700.	0.7578E-01	6	1.0	1.0	10000.0	2.44	0.
800.	0.6149E-01	6	1.0	1.0	10000.0	2.44	0.
900.	0.5113E-01	6	1.0	1.0	10000.0	2.44	0.

1000.	0.4332E-01	6	1.0	1.0	10000.0	2.44	0.
1100.	0.3745E-01	6	1.0	1.0	10000.0	2.44	0.
1200.	0.3279E-01	6	1.0	1.0	10000.0	2.44	0.
1300.	0.2901E-01	6	1.0	1.0	10000.0	2.44	0.
1400.	0.2590E-01	6	1.0	1.0	10000.0	2.44	0.
1500.	0.2331E-01	6	1.0	1.0	10000.0	2.44	0.
1600.	0.2111E-01	6	1.0	1.0	10000.0	2.44	0.

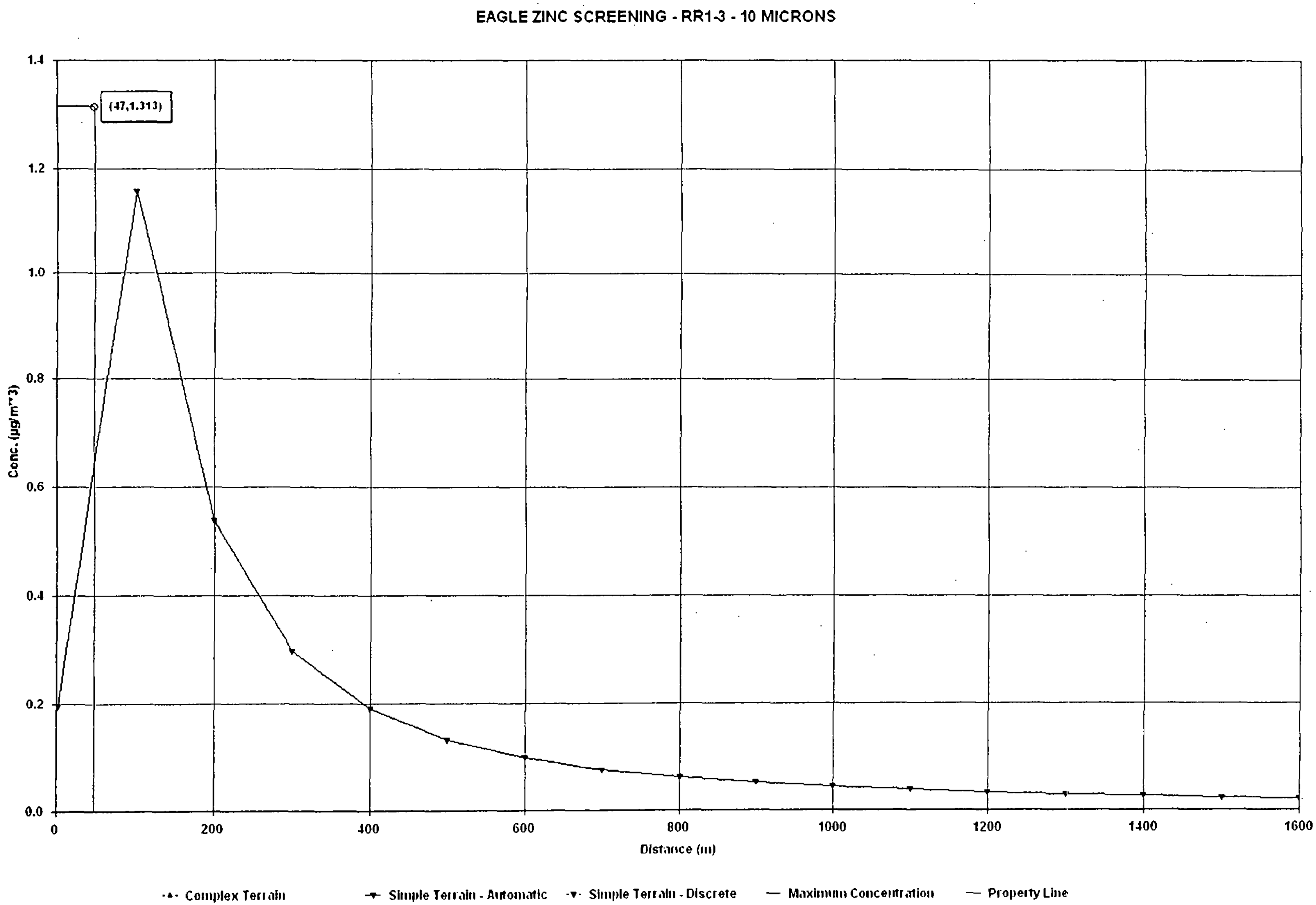
MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

47.	1.313	5	1.0	1.0	10000.0	2.44	0.

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	1.313	47.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****


EAGLE ZINC SCREENING - RR1-3 - 10 MICRONS
(47,1.313)
Conc. (µg/m**3)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0
200
400
600
800
1000
1200
1400
1600
Distance (m)
Complex Terrain
Simple Terrain - Automatic
Simple Terrain - Discrete
Maximum Concentration
Property Line

Residue Pile RR1-3

SCREEN3 Output File
30-micron Emission Rate

03/29/2005
12:37:09

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc Screening - RR1-3 - 30 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.115000E-05
SOURCE HEIGHT (M) = 2.4400
LENGTH OF LARGER SIDE (M) = 18.5200
LENGTH OF SMALLER SIDE (M) = 6.1700
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.3888	1	1.0	1.0	320.0	2.44	0.
100.	2.321	6	1.0	1.0	10000.0	2.44	0.
200.	1.080	6	1.0	1.0	10000.0	2.44	0.
300.	0.5949	6	1.0	1.0	10000.0	2.44	0.
400.	0.3792	6	1.0	1.0	10000.0	2.44	0.
500.	0.2644	6	1.0	1.0	10000.0	2.44	0.
600.	0.1961	6	1.0	1.0	10000.0	2.44	0.
700.	0.1521	6	1.0	1.0	10000.0	2.44	0.
800.	0.1234	6	1.0	1.0	10000.0	2.44	0.
900.	0.1026	6	1.0	1.0	10000.0	2.44	0.

1000.	0.8694E-01	6	1.0	1.0	10000.0	2.44	0.
1100.	0.7516E-01	6	1.0	1.0	10000.0	2.44	0.
1200.	0.6580E-01	6	1.0	1.0	10000.0	2.44	0.
1300.	0.5822E-01	6	1.0	1.0	10000.0	2.44	0.
1400.	0.5198E-01	6	1.0	1.0	10000.0	2.44	0.
1500.	0.4677E-01	6	1.0	1.0	10000.0	2.44	0.
1600.	0.4237E-01	6	1.0	1.0	10000.0	2.44	0.

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

47. 2.636 5 1.0 1.0 10000.0 2.44 0.

****

*** SUMMARY OF SCREEN MODEL RESULTS ***

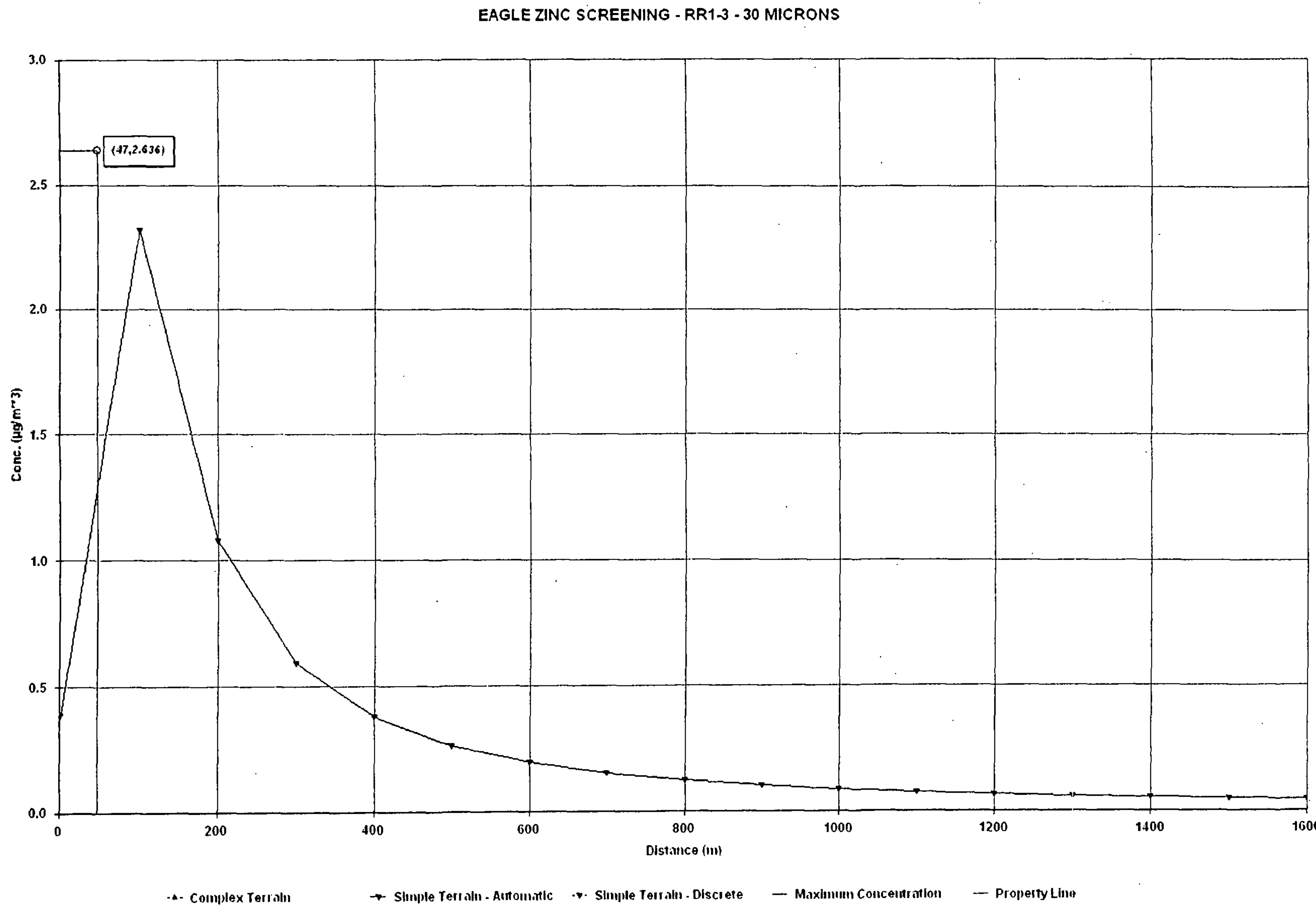
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	2.636	47.	0.

****

** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

****


EAGLE ZINC SCREENING - RR1-3 - 30 MICRONS
(47,2.636)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Conc. (µg/m**3)
0
200
400
600
800
1000
1200
1400
1600
Distance (m)
Complex Terrain
Simple Terrain - Automatic
Simple Terrain - Discrete
Maximum Concentration
Property Line

Residue Pile RR2-11

SCREEN3 Output File
10-micron Emission Rate

03/29/2005
12:27:41

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc Screening - RR2-11 - 10 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.573000E-06
SOURCE HEIGHT (M) = 9.1500
LENGTH OF LARGER SIDE (M) = 20.9700
LENGTH OF SMALLER SIDE (M) = 10.4900
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.2864E-06	1	1.0	1.0	320.0	9.15	6.
100.	0.1965	3	1.0	1.0	320.0	9.15	0.
200.	0.1821	5	1.0	1.0	10000.0	9.15	1.
300.	0.1629	6	1.0	1.0	10000.0	9.15	0.
400.	0.1638	6	1.0	1.0	10000.0	9.15	0.
500.	0.1448	6	1.0	1.0	10000.0	9.15	0.
600.	0.1235	6	1.0	1.0	10000.0	9.15	0.
700.	0.1049	6	1.0	1.0	10000.0	9.15	0.
800.	0.9001E-01	6	1.0	1.0	10000.0	9.15	0.
900.	0.7791E-01	6	1.0	1.0	10000.0	9.15	0.

1000.	0.6811E-01	6	1.0	1.0	10000.0	9.15	0.
1100.	0.6026E-01	6	1.0	1.0	10000.0	9.15	0.
1200.	0.5376E-01	6	1.0	1.0	10000.0	9.15	0.
1300.	0.4832E-01	6	1.0	1.0	10000.0	9.15	0.
1400.	0.4372E-01	6	1.0	1.0	10000.0	9.15	0.
1500.	0.3979E-01	6	1.0	1.0	10000.0	9.15	0.
1600.	0.3640E-01	6	1.0	1.0	10000.0	9.15	0.

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

88.	0.2013	3	1.0	1.0	320.0	9.15	1.

****

*** SUMMARY OF SCREEN MODEL RESULTS ***

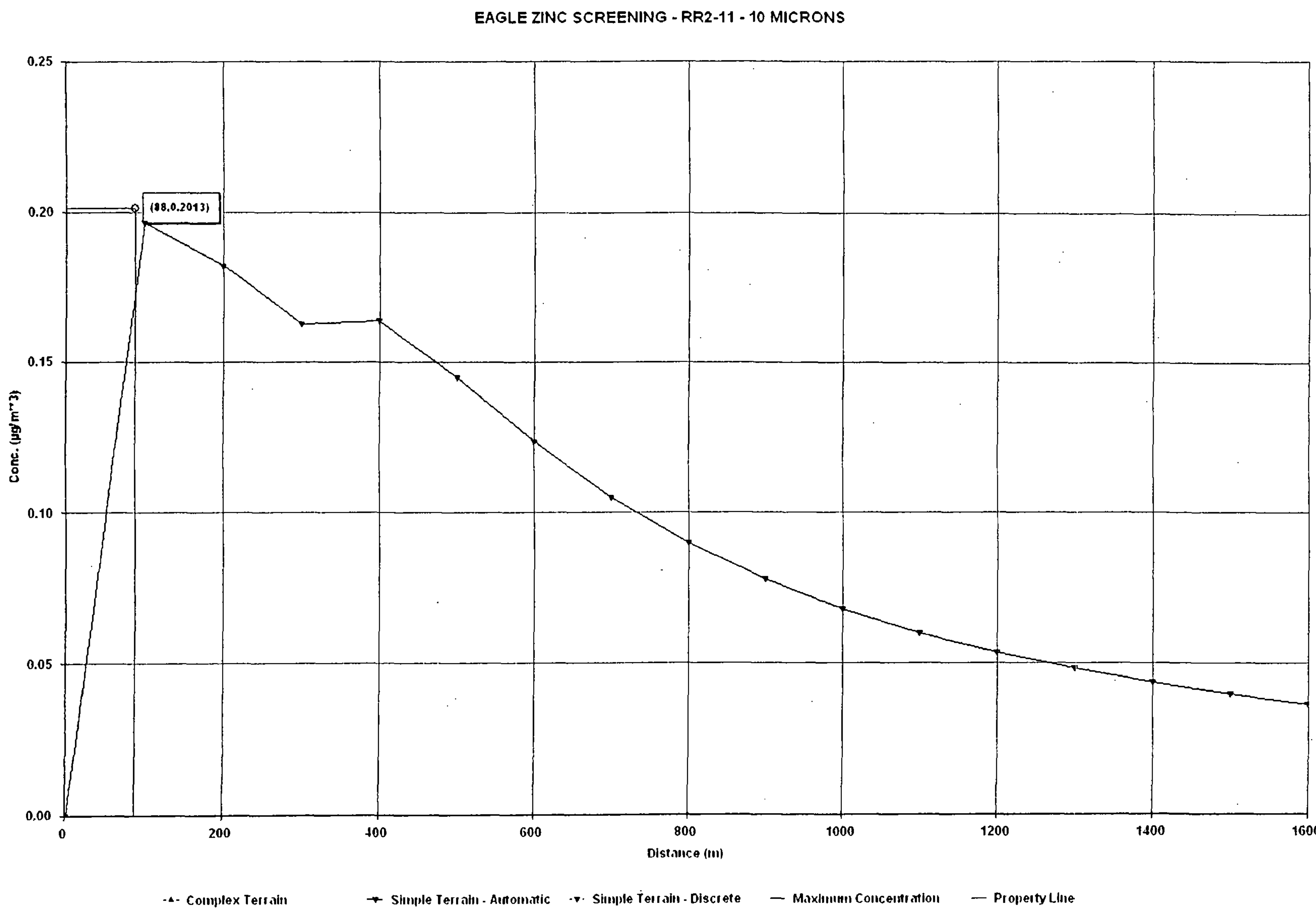
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	0.2013	88.	0.

****

** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

****



EAGLE ZINC SCREENING - RR2-11 - 10 MICRONS
0.25
0.20
0.15
0.10
0.05
0.00
Conc. (µg/m^3)
(88,0.2013)
0
200
400
600
800
1000
1200
1400
1600
Distance (m)
Complex Terrain
Simple Terrain - Automatic
Simple Terrain - Discrete
Maximum Concentration
Property Line

<u>**Residue Pile RR2-11**</u>

SCREEN3 Output File
30-micron Emission Rate

03/29/2005
12:19:42

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc Screening - Pile RR2-11 - 30 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.115000E-05
SOURCE HEIGHT (M) = 9.1500
LENGTH OF LARGER SIDE (M) = 20.9700
LENGTH OF SMALLER SIDE (M) = 10.4900
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.5748E-06	1	1.0	1.0	320.0	9.15	6.
100.	0.3943	3	1.0	1.0	320.0	9.15	0.
200.	0.3654	5	1.0	1.0	10000.0	9.15	1.
300.	0.3270	6	1.0	1.0	10000.0	9.15	0.
400.	0.3287	6	1.0	1.0	10000.0	9.15	0.
500.	0.2905	6	1.0	1.0	10000.0	9.15	0.
600.	0.2478	6	1.0	1.0	10000.0	9.15	0.
700.	0.2106	6	1.0	1.0	10000.0	9.15	0.
800.	0.1807	6	1.0	1.0	10000.0	9.15	0.
900.	0.1564	6	1.0	1.0	10000.0	9.15	0.

1000.	0.1367	6	1.0	1.0	10000.0	9.15	0.
1100.	0.1209	6	1.0	1.0	10000.0	9.15	0.
1200.	0.1079	6	1.0	1.0	10000.0	9.15	0.
1300.	0.9698E-01	6	1.0	1.0	10000.0	9.15	0.
1400.	0.8775E-01	6	1.0	1.0	10000.0	9.15	0.
1500.	0.7985E-01	6	1.0	1.0	10000.0	9.15	0.
1600.	0.7306E-01	6	1.0	1.0	10000.0	9.15	0.

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

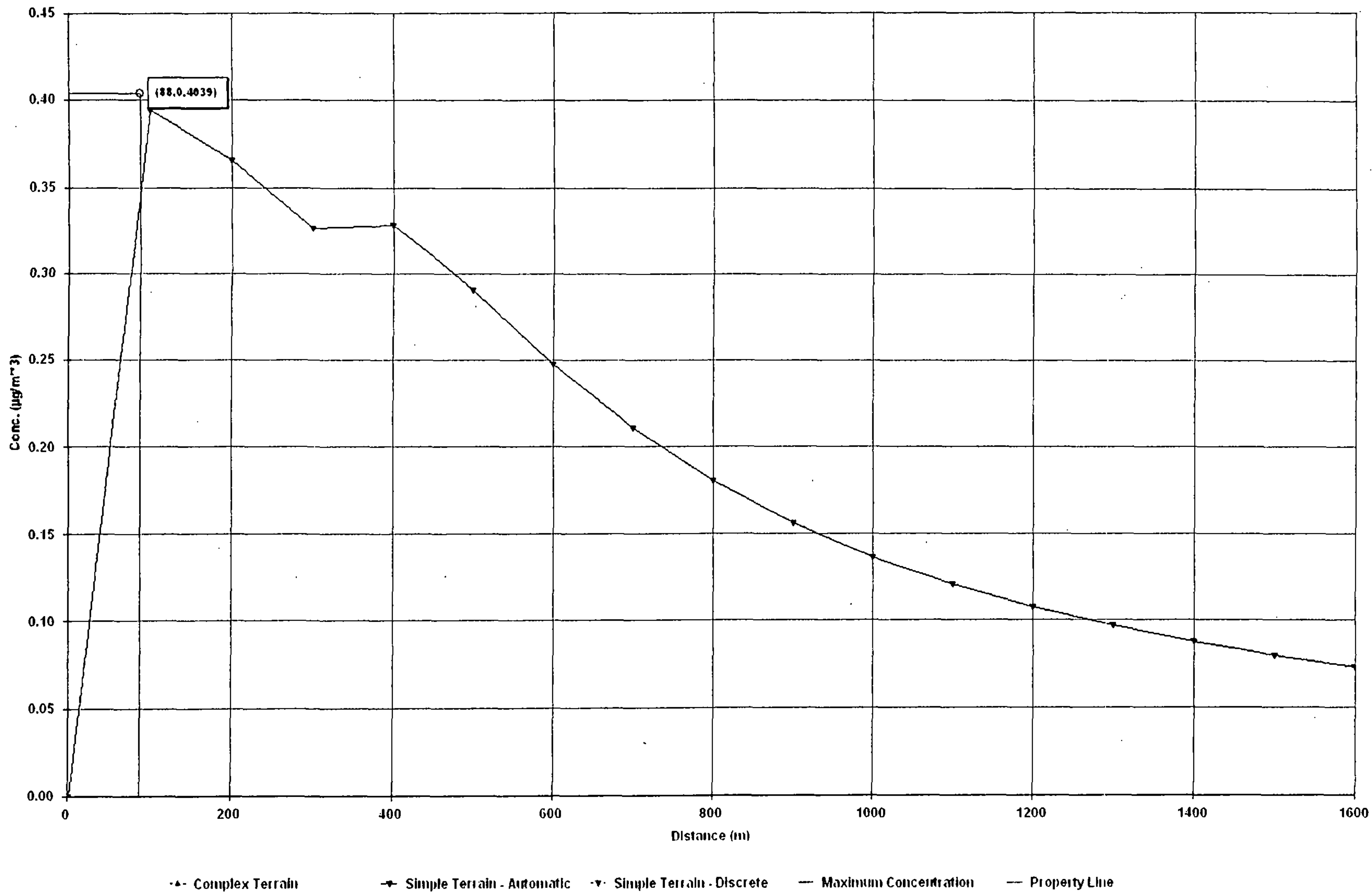
88.	0.4039	3	1.0	1.0	320.0	9.15	1.

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	0.4039	88.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****

EAGLE ZINC SCREENING - PILE RR2-11 - 30 MICRONS



Residue Pile RRO-12

SCREEN3 Output File
10-micron Emission Rate

03/31/2005
12:22:21

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc - RRO-12 - 10 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.573000E-06
SOURCE HEIGHT (M) = 4.5700
LENGTH OF LARGER SIDE (M) = 21.2900
LENGTH OF SMALLER SIDE (M) = 10.6400
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.1493E-01	1	1.0	1.0	320.0	4.57	1.
100.	0.7300	5	1.0	1.0	10000.0	4.57	0.
200.	0.6479	6	1.0	1.0	10000.0	4.57	0.
300.	0.4530	6	1.0	1.0	10000.0	4.57	0.
400.	0.3174	6	1.0	1.0	10000.0	4.57	0.
500.	0.2328	6	1.0	1.0	10000.0	4.57	0.
600.	0.1777	6	1.0	1.0	10000.0	4.57	0.
700.	0.1405	6	1.0	1.0	10000.0	4.57	0.
800.	0.1154	6	1.0	1.0	10000.0	4.57	0.
900.	0.9667E-01	6	1.0	1.0	10000.0	4.57	0.

1000.	0.8242E-01	6	1.0	1.0	10000.0	4.57	0.
1100.	0.7159E-01	6	1.0	1.0	10000.0	4.57	0.
1200.	0.6293E-01	6	1.0	1.0	10000.0	4.57	0.
1300.	0.5587E-01	6	1.0	1.0	10000.0	4.57	0.
1400.	0.5003E-01	6	1.0	1.0	10000.0	4.57	0.
1500.	0.4513E-01	6	1.0	1.0	10000.0	4.57	0.
1600.	0.4097E-01	6	1.0	1.0	10000.0	4.57	0.

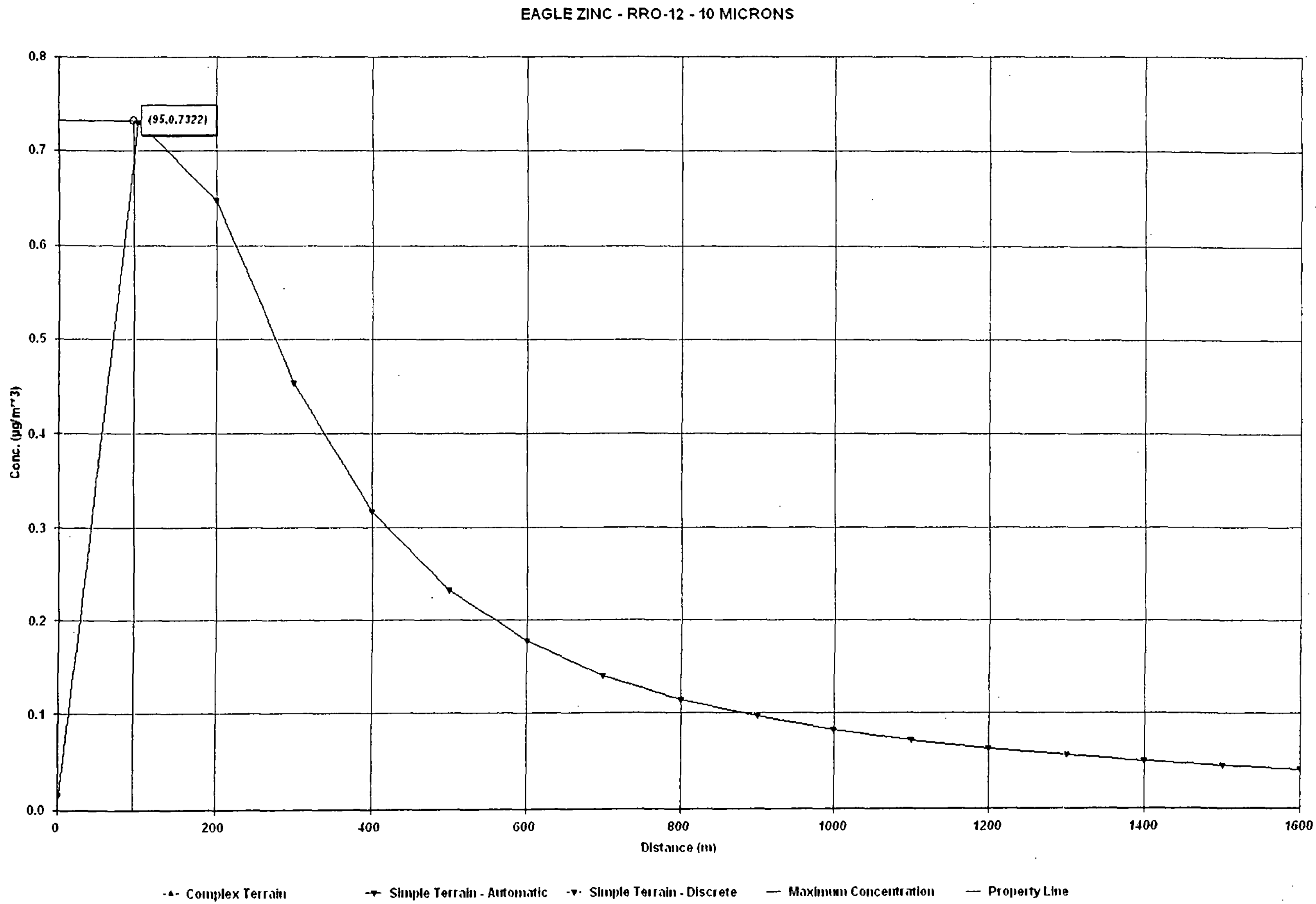
MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

95.	0.7322	5	1.0	1.0	10000.0	4.57	0.

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	0.7322	95.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****


EAGLE ZINC - RRO-12 - 10 MICRONS
(95,0.7322)
Conc. (µg/m^3)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
200
400
600
800
1000
1200
1400
1600
Distance (m)
Complex Terrain
Simple Terrain - Automatic
Simple Terrain - Discrete
Maximum Concentration
Property Line

Residue Pile RRO-12

SCREEN3 Output File
30-micron Emission Rate

03/31/2005
12:17:40

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc - RRO-12 - 30 micron ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.115000E-05
SOURCE HEIGHT (M) = 4.5700
LENGTH OF LARGER SIDE (M) = 21.2900
LENGTH OF SMALLER SIDE (M) = 10.6400
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.2997E-01	1	1.0	1.0	320.0	4.57	1.
100.	1.465	5	1.0	1.0	10000.0	4.57	0.
200.	1.300	6	1.0	1.0	10000.0	4.57	0.
300.	0.9091	6	1.0	1.0	10000.0	4.57	0.
400.	0.6371	6	1.0	1.0	10000.0	4.57	0.
500.	0.4672	6	1.0	1.0	10000.0	4.57	0.
600.	0.3566	6	1.0	1.0	10000.0	4.57	0.
700.	0.2820	6	1.0	1.0	10000.0	4.57	0.
800.	0.2316	6	1.0	1.0	10000.0	4.57	0.
900.	0.1940	6	1.0	1.0	10000.0	4.57	0.

1000.	0.1654	6	1.0	1.0	10000.0	4.57	0.
1100.	0.1437	6	1.0	1.0	10000.0	4.57	0.
1200.	0.1263	6	1.0	1.0	10000.0	4.57	0.
1300.	0.1121	6	1.0	1.0	10000.0	4.57	0.
1400.	0.1004	6	1.0	1.0	10000.0	4.57	0.
1500.	0.9057E-01	6	1.0	1.0	10000.0	4.57	0.
1600.	0.8223E-01	6	1.0	1.0	10000.0	4.57	0.

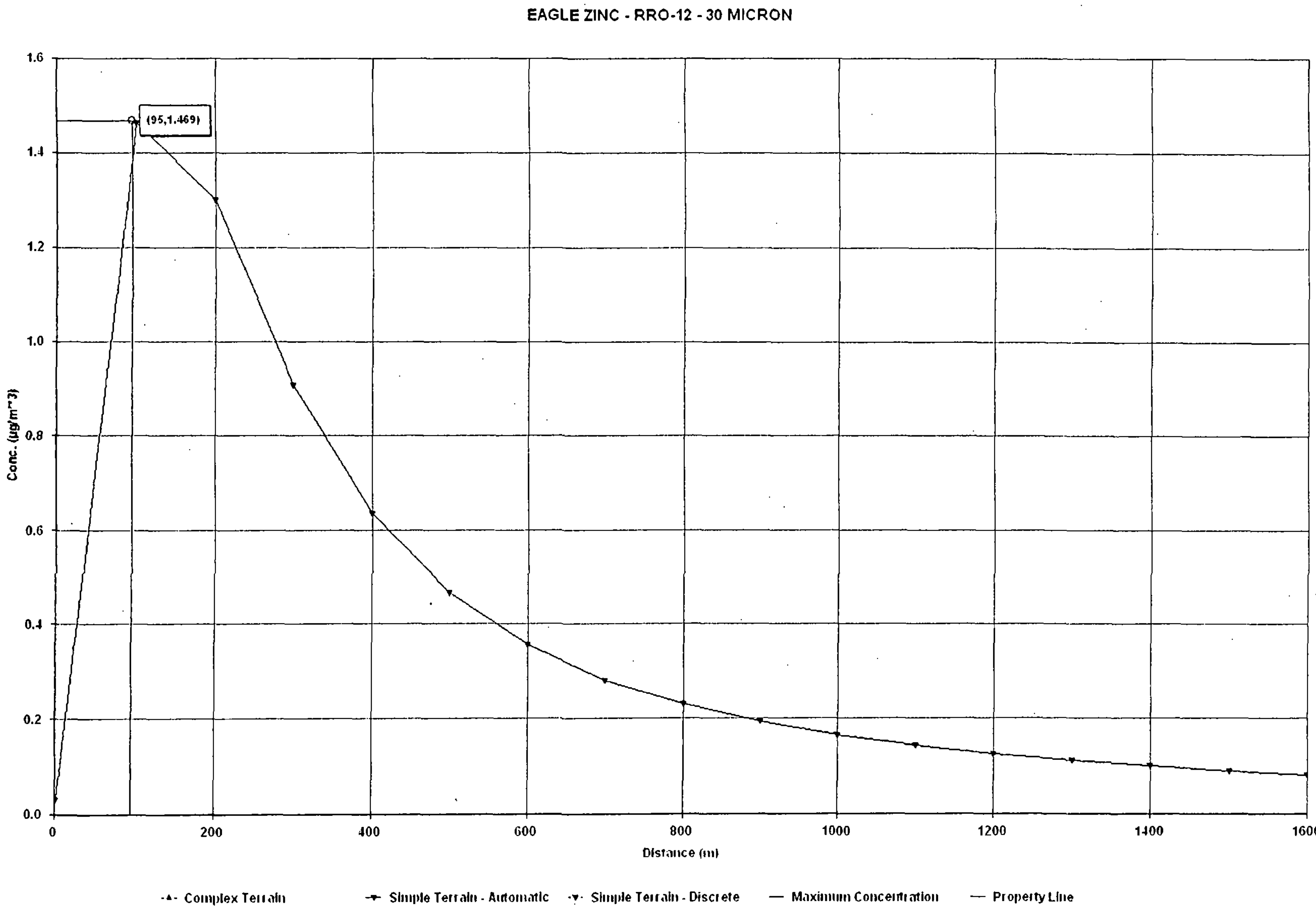
MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

95.	1.469	5	1.0	1.0	10000.0	4.57	0.

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	1.469	95.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****



EAGLE ZINC - RRO-12 - 30 MICRON
(95,1.469)
Conc. (µg/m^3)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
0
200
400
600
800
1000
1200
1400
1600
Distance (m)
Complex Terrain
Simple Terrain - Automatic
Simple Terrain - Discrete
Maximum Concentration
Property Line

APPENDIX F

SCREEN3 Model Dispersion Results

APPENDIX F
SCREEN 3 MODEL DISPERSION RESULTS, 10 MICRONS

10 MICRON, 1 HOUR CONCENTRATION RESULTS - TO BE USED FOR DEPOSITION/SOIL PATHWAY								
Distance from Source (m)	1 Hour Concentration (ug/m^3)							
	RR2-11	RCO-10	RR1-3	CPH-9	CPH-6	RRO-12	NP-15	NP-16
1	2.864E-07	5.122E-07	1.937E-01	6.306E-09	1.636E-08	1.493E-02	5.616E-04	1.815E-09
100	1.965E-01	1.154E-01	1.156E+00	7.481E-02	7.547E-02	7.300E-01	2.277E-01	7.399E-02
200	1.821E-01	1.074E-01	5.380E-01	7.127E-02	6.496E-02	6.479E-01	1.822E-01	7.336E-02
300	1.629E-01	9.450E-02	2.964E-01	5.568E-02	4.425E-02	4.530E-01	1.138E-01	7.075E-02
400	1.638E-01	7.275E-02	1.889E-01	4.087E-02	3.072E-02	3.174E-01	7.623E-02	6.144E-02
500	1.448E-01	5.599E-02	1.318E-01	3.069E-02	2.242E-02	2.328E-01	5.458E-02	5.033E-02
600	1.235E-01	4.403E-02	9.772E-02	2.378E-02	1.708E-02	1.777E-01	4.113E-02	4.106E-02
700	1.049E-01	3.545E-02	7.578E-02	1.897E-02	1.347E-02	1.405E-01	3.221E-02	3.387E-02
800	9.001E-02	2.943E-02	6.149E-02	1.566E-02	1.104E-02	1.154E-01	2.629E-02	2.853E-02
900	7.791E-02	2.489E-02	5.113E-02	1.318E-02	9.253E-03	9.667E-02	2.196E-02	2.439E-02
1000	6.811E-02	2.137E-02	4.332E-02	1.128E-02	7.887E-03	8.242E-02	1.866E-02	2.112E-02
1100	6.026E-02	1.865E-02	3.745E-02	9.823E-03	6.850E-03	7.159E-02	1.618E-02	1.855E-02
1200	5.376E-02	1.646E-02	3.279E-02	8.652E-03	6.020E-03	6.293E-02	1.419E-02	1.645E-02
1300	4.832E-02	1.466E-02	2.901E-02	7.693E-03	5.342E-03	5.587E-02	1.258E-02	1.471E-02
1400	4.372E-02	1.316E-02	2.590E-02	6.898E-03	4.782E-03	5.003E-02	1.125E-02	1.325E-02
1500	3.979E-02	1.189E-02	2.331E-02	6.228E-03	4.312E-03	4.513E-02	1.013E-02	1.201E-02
1600	3.640E-02	1.082E-02	2.111E-02	5.659E-03	3.913E-03	4.097E-02	9.190E-03	1.095E-02
MAX - Distance Specified	**88 m** **2.013E-01**	**58 m** **1.211E-01**	**47 m** **1.313E+00**	**51 m** **7.988E-02**	**90 m** **7.662E-02**	**95 m** **7.322E-01**	**74 m** **2.507E-01**	**73 m** **8.302E-02**

Note: Piles RR1-4, NP-13, NP-14, RCO-5, MP1-21, RR1-2 and RR1-1 result in a friction velocity less than the threshold friction velocity. Therefore, no emissions due to wind erosion occur.